IGHT, MARCH 2, 1939 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

East Engin. Library

MAR 13 1939

FLIGHT

6D.

The AIRCRAFT ENGINEER

. 1575
. XXXV

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

Ammunition Feed and Discharge Chutes in Aeronoid. (Low friction losses, light weight.)

Palmer Light Rubber Matting for safe Foothold on wing treads, cabin and gun turret floors, etc.

Complete Rudder-bar ends with Palmer special toe-strap.

Palmer Spade Grip embodying Gunfire and Brake Controls (Hydraulic).

PALMER

TYRES, WHEELS, BRAKES,
GUN FIRING GEAR AND ACCESSORIES.

THE PALMER TYRE LTD. [illegible] MILLBANK, S.W.1

"Bristol"

BLENHEIM BOMBER

Fitted with two "Bristol" Mercury engines, the Blenheim is standard equipment for many squadrons of the R.A.F. at home and overseas, and is the fastest medium bomber in service anywhere in the world.

THE BRISTOL AEROPLANE COMPANY LIMITED, FILTON HOUSE, BRISTOL.

MANUFACTURERS OF HIGH-PERFORMANCE AIRCRAFT SINCE 1910.

The difference between the first fragile "Bristol" aeroplanes of 1910 and the modern all-metal "Bristol" monoplane, represents 29 years of aircraft production, research and development.

From the first "Bristol" Bcxkites of 1910 to the famous "Bristol" Fighter which, in 1917, gave the Allies supremacy in the air; and so to the equally famous "Bristol" Blenheim Bomber, the first all-metal stressed-skin cantilever monoplane to go into quantity production for the Royal Air Force, "Bristol" development has made aviation history.

FLIGHT
The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor C. M. POULSEN

Managing Editor G. GEOFFREY SMITH

Chief Photographer JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (50 lines).

8-10, CORPORATION ST., COVENTRY. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.

GUILDHALL BUILDINGS, NAVIGATION ST., BIRMINGHAM, 2. Telegrams: Autopress, Birmingham. Telephone: Midland 2971.

260, DEANSGATE, MANCHESTER, 3. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.

26B, RENFIELD ST., GLASGOW, C.2. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Canada: Year, £1 13 0. 6 months, 16s. 6d. 3 months, 8s. 6d.
Other Countries: Year, £1 15 0. 6 months, 18s. 0d. 3 months, 9s. 0d.

No. 1575. Vol. XXXV. MARCH 2, 1939. Thursdays, Price 6d.

The Outlook

An International Problem

UNTIL last week, when the International Conference on Aircraft Fuel was opened by Sir Kingsley Wood, the degree to which air transport has been hampered by fuel taxation was not likely to have been realised by the ordinary traveller. Even now the importance of this Conference will not be understood until it is stated in black and white that something like fifty nations are represented under the chairmanship of Lord Swinton.

In his opening speech Sir Kingsley explained the reasons for, and purposes of, the Conference. Following a questionnaire sent to European Governments in 1934 by the Advisory and Technical Committee on Communications and Transit of the League of Nations, it was realised that the exemption of fuel and oil taxation for aircraft was a reasonable proposition. In January, 1936, the League decided that this country should arrange such an agreement, which was duly welcomed by the I.C.A.N.

The various Governments were invited to accept a draft agreement, but the diplomatic correspondence which followed the invitation made it clear that only an international conference would permit agreement within a reasonable time and without unreasonable trouble. Though it seemed that the general principles of the agreement were acceptable, many reservations were made, and each would have required the concurrence of other Governments. Obviously, it was a case for the conference table, and, this being so, the opportunity was taken of inviting representatives of all the Governments throughout the world.

It is greatly to be hoped that the Conference will succeed in finding ways and means of surmounting or circumventing the many detail obstacles with which the road to a solution is strewn.

Getting Them Together

WHATEVER the Air Transport Licensing Authority may or may not have succeeded in doing, it has at least carried out one very important service—that of bringing the various internal airline operators together round a conference table. Now, at last, these operators should have no illusions about each other's plans and aspirations, and should have a good understanding of each other's difficulties.

We have heard complaints to the effect that the Authority lacks expert knowledge. Even if this was true at one time, it is certainly not true now, and, in any case, a completely new and unbiased outlook was essential for fairness in judgment. Clear-minded judges were required—not internal airline experts.

Anybody who has been concerned, even in a small way, with the operators must have developed certain subconscious ideas of rights and injustices, and it was essential that the Authority should be clear of all charges of favouritism. Even the Air Ministry has its own bias and could never have carried out the work to the satisfaction of all concerned.

It seems to us that the judgment between Scottish Airways and Allied Airways, for instance, has been admirable in its clarity, understanding, and realism.

Those Retracting Undercarriages

THAT recent mishaps caused by the jamming of retracting undercarriages lend weight to the suggestion that the task of designing retractable undercarriages should be left to those who specialise on this work is the argument put forward by Mr. George H. Dowty in a letter in our Correspondence page this week There was a time when nearly all the aircraft firms de-

THE OUTLOOK (CONTINUED)

signed and manufactured everything themselves. Undercarriages, airscrews, engine mountings and so forth all came within the purview of the aircraft designer.

With the introduction and almost general adoption of metal airscrews, of fixed or variable pitch, the design and manufacture of airscrews passed out of the aircraft designer's hands and into those of specialist firms. When engine installations became really complicated by the increasing number of accessories demanded, and when the specific powers developed began to make cooling problems exacting, the engine manufacturers felt they ought to have a considerable say in the design of the power installation. When the retractable undercarriage came to be almost universally adopted, many aircraft firms continued to do their own designing, although quite a large percentage turned to the specialist firms.

One may disregard the fact that Mr. Dowty is an "interested party," and examine the problem purely on technical grounds. Designing a retractable undercarriage *is* a task demanding specialised knowledge and experience. But is it not a fact that nearly every one of the aircraft firms which have changed over to doing their own undercarriage work have done so not because they particularly wanted to but because, at the time, the specialist firms were not in a position to guarantee delivery by the specified date?

We admit that the position may have changed by now, but most of the undercarriages which have failed recently were designed some months, or even years, ago, when the delivery question *was* serious.

Atlantic Items

TWO Albatross machines which had been ordered with the idea of trying them out on the Atlantic crossing are to be handed over to Imperial Airways for regular service elsewhere. This will ease the pressure on the company's fleet which has followed on the withdrawal of the Ensign machines.

One cannot help wondering what will be said on the other side of the Atlantic about this change of plan, for unfortunately there is a section of the Press in the United States which persists in misunderstanding every decision taken by Imperial Airways. For instance, when the British company announced that it would start flights across the Atlantic in June, as soon as the waters in Newfoundland were free from ice, the comment was that the Americans were ready to start earlier but were held up because the British were not ready. An earlier start is only possible on the Azores route, which is not affected by ice; and the Cabot class of boats, which rely on fuelling in the air, cannot use that route, while the Boeing 314 boats can do so. As was announced by the Under-Secretary for Air in the House of Commons, the stipulation in the agreement which provides for simultaneous starts has been waived, and if a Boeing boat arrives in the British Isles before June 1 it will be made welcome. It has been announced that one of these boats will cross to Lisbon next week. It will probably come up to Southampton.

The North American Terminus

ANOTHER instance was this. A change in the American arrangements for licensing routes made it necessary for Imperial Airways to make a new application to the Civil Aeronautics Authority in the States for leave to fly to New York, and it is expected that that permission will shortly be granted. In the meantime, Imperial Airways announced that, while they hoped to fly to New York, in any case they would fly from Foynes to Montreal. This has also been misunderstood in parts of the United States, and the *Evening Sun*, of Baltimore, for instance, wrote: "What they (i.e., the British) have been discussing recently has been a scheme to land all of their planes in Canada—a scheme which would keep the North American base on English (*sic*) soil and would thus enable them to monopolise the service in both directions." There is no such desire on the part of the British. We want to fly to New York, and we shall do so if the Civil Aeronautics Authority grants permission, which, we hope and believe, will very soon be the case.

In the meantime New Zealand is awaiting the renewal of the Pan-American service to Auckland, which has been held up for over a year by the American company's shortage of flying boats. The first of the Boeing 314 boats is now on the Pacific coast, and so the service may soon be resumed. But even with six of these new boats it is hard to see how Pan-American Airways will be able to maintain full services across both the Pacific and the Atlantic in the coming summer. The American-French service between New York and Marseilles is not, we understand, the concern of Pan-American Airways. According to a recent agreement that service will be operated by Export Air Lines.

Forthcoming Events

MARCH.

Tues., 7th. R.Ae.S. Students' Section Lecture: "Plastics," by M. Langley, A.M. Inst. N.A., M.I.Ae.E.

Thurs., 9th. R.Ae.S. Portsmouth Branch Lecture: "Plastics," by G. Dring, M.A., B.Sc., F.I.C.

Tues., 14th. R.Ae.S. Belfast Branch: Film on Steel Making, with commentary by J. G. Hopcraft, M.C., A.M.I.Ae.E.

Wed., 15th. R.U.S.I. Lecture: "Work of the R.A.F. on the N.W. Frontier," by Group Capt. N. H. Bottomley, C.I.E., D.S.O., A.F.C.

Thurs., 16th. R.Ae.S. Lecture*: "Relative Merits of Carburetters and Direct Petrol Injection," by J. E. Ellor, F.R.Ae.S., and F. M. Owner, F.R.Ae.A.

Thurs., 30th. R.Ae.S. Lecture: "The Problem of Ancillary Power Services on Aircraft," by R. H. Chaplin, B.Sc., A.F.R.Ae.S., and F. Nixon, B.Sc., R.Ae.S.

APRIL.

Sat., 15th. Opening of West Hartlepool Airport by the Secretary of State for Air.

Thurs., 20th. R.Ae.S. Lecture*: "Possible Steel Developments," by Dr. T. Swinden, F.R.Ae.S.

MAY.

Thurs., 4th. R.Ae.S. Lecture*: "Strength of Thin Metal Construction," by H. L. Cox.

Sat., 13th. R.Ae.S. Garden Party.

Sat., 20th. Empire Air Day.

Thurs., 25th. R.Ae.S.: Wilbur Wright Memorial Lecture by Dr. G. W. Lewis.

Sat., 27th. London-I.O.M. Race.

Mon., 29th. Manx Air Derby and Tynwald Race.

JUNE.

Sat., 24th. Royal Air Force Garden Party.

JULY.

Sat., 8th. - Sun., 23rd. Brussels Aero Show.

Sat., 29th. - Sun., 30th. Frankfurt International Flying Meeting.

* All these lectures take place at 6.30 p.m. at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1.

A SQUARE DEAL for the NAVIGATOR

Some Ideas on the Ideal "Office": Convenience Means Accuracy—Accuracy Spells Safety

By FRANCIS CHICHESTER

THE navigator, it seems, is about to emerge as a beautiful and important butterfly from the drab chrysalis which has hardly been considered seriously by anybody. And the fact which is suddenly going to drive home the importance of his work, and show that he is the most valuable member of the crew, is transatlantic flying.

You will say that the captain is the man, and so he is, but the qualities which put him there are his judgment and his skill as a navigator and not his ability as a pilot. Machines are saved or lost through such things as the summing-up of weather conditions and the accuracy with with the machine's position is known.

Only a very simple sum is needed to illustrate the latter. If a flying boat is forced down at sea and its position is known to three miles, seven square miles must be searched for it; if, however its position is only known to within 50 miles—and I think pilots will agree that, until recently, this was considered very good accuracy on long flights—no less than 7,857 square miles of ocean must be searched. Nor is this all; if rescue is delayed and the rate of drift is not known, the circle of uncertainty becomes a cylinder; and finally, because the wind may have changed, a cone.

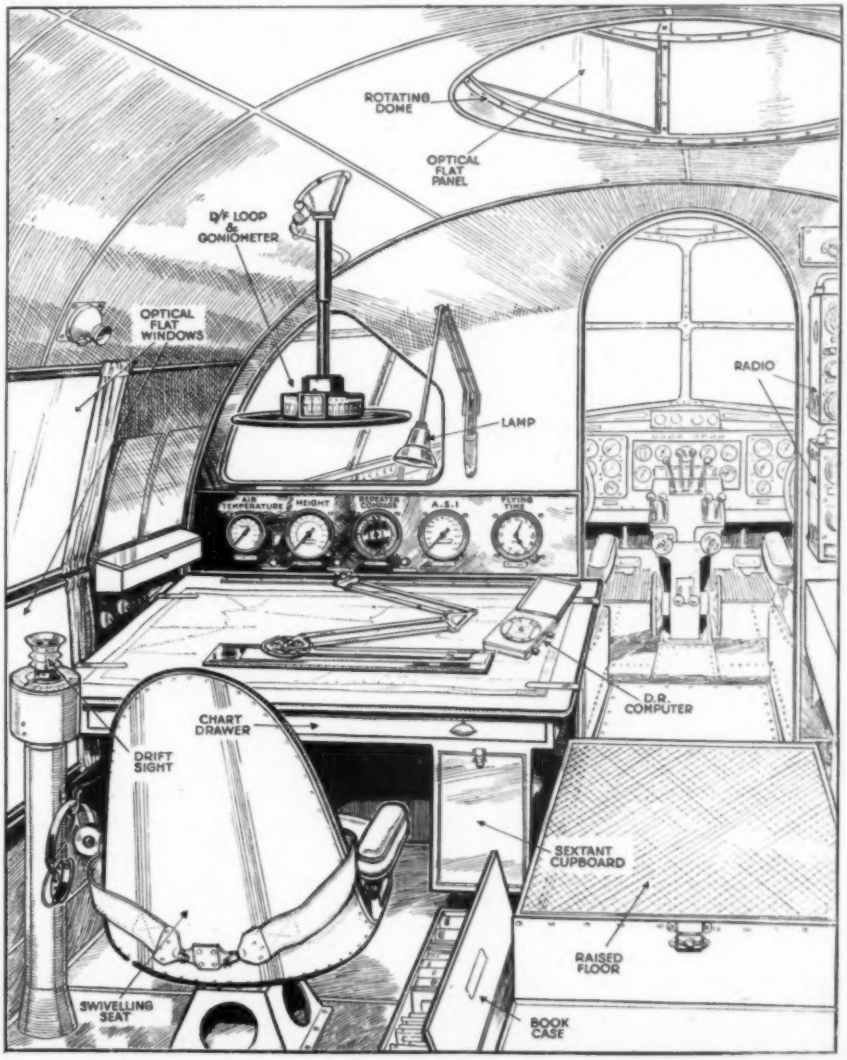
A navigator, skilful at position-finding, will find out by celestial or drift observations that he is flying into an unexpectedly strong headwind and, if he has good judgment and experience as well, he will probably save several hours' flying, not to mention valuable petrol and oil, by changing his course.

Obviously the pilot cannot carry out the celestial observations, radio goniometry, navigation by D.R., and planning of the route, while flying the machine. Not only must there be a navigator who can be at his post the whole time, but this member of the crew needs special accommodation and equipment.

Here is a picture of the kind of office with which every long-distance machine should be fitted to-day:—

First, it is in a favourable situation, so placed that the navigator can make all his observations without leaving it. Close by him is a large window through which he can observe the ground or the sea without moving from his seat. It will not be possible for him to obtain a view straight ahead, but he should be able to see through this window to within 10 deg. of it and also to within 10 deg. of the vertical.

For drift observation he has a vertical periscopic sight at his elbow and, merely by leaning over and looking through the eyepiece, he can observe the ground or sea passing under the machine. With all his other duties it is too much to expect him to make constant trips to a distant part of the aircraft, as he usually has to do to-day, after scrambling through cabins and mail compartments, to observe drift from some position of acute discomfort,



An impression of the author's hypothetical ideal. Necessarily situated so far forward in the cockpit roof, the celestial-observation dome would probably have to be made retractable.

such as that of lying down on the keel of a flying boat's stern. The periscopic drift sight projects through the floor. The important point is that the navigator can take a brief look through the sight every, say, ten minutes to be sure that the drift has not changed.

Possibly the navigator should work the loop aerial himself, and take any bearings of W/T. stations which he requires for position-fixing. This might give him extra confidence and save long explanations to the W/T. operator, while leaving the latter free for message-sending and receiving, taking down weather reports, asking for bearings and so on. One can therefore visualise a goniometer in front of the navigator, just above the level of his head when he is sitting at the chart-table. This will have a lubber-line and a disc divided into degrees, which he can reach without moving from his seat and rotate until he has obtained the bearing of the station he requires.

"Shooting" from a Turret

Through the large window beside him he can make sextant observations of the sun or stars, if they are on his side of the machine, in comfort and without moving. In most present types these observations must again be made while the navigator is crouching in some unnatural position, the sextant, which is no feather, held before his face while he sways from side to side trying to sight the sun through some miserable aperture. In such an attitude most people would be totally unable to use a sextant, yet the wretched navigator is expected to be skilled enough to do it and to obtain an accuracy within two minutes of arc.

Imperial Airways, in their Short boats, have made a step forward by cutting a circular hatch in the roof close to the navigator's table and making a Perspex dome which can be fitted into it from inside. This enables the navigator to stand in a comfortable position while observing. Standing is probably the best position. Any vibration has then to pass through the observer's body before it can affect the sextant. In other words the vibration is damped to the maximum extent; and, if rough air is causing accelerations, standing enables the navigator to sense the worst of these and meanwhile to stop observations.

In the dome his head and the sextant are above the level of the machine, giving him a good view all round. Although not perfect, the dome idea is a distinct advance on anything previously tried. Actually the least glimmer of light is so magnified and reflected in the concavity that it is difficult to take a star sight unless all nearby light has been completely dowsed. Also, the refraction errors are considerable; an observation made through the Perspex half-way up differs from one made through it near the base by as much as 10', while even readings taken at the same level may vary as much as 3' or 4' between, say, north and east. What is really needed is a rotatable dome with one large flat side which can always be brought to face the body to be observed; the flat panel being optically true so as to give no refraction. In a similar way, the large window at the navigator's side should also be optically true.

Hunting the Bubble

The accuracy of sextant observations is greatly influenced by the natural stability of the aeroplane and the efficiency of the automatic pilot. The worst defect in a machine is yawing or "hunting." Every yaw is the beginning of a turn, so that acceleration is set up which acts on the sextant bubble, locking it in a false position, just as the water in a bucket is locked in an unnatural position when the bucket is swung at arm's length. "Hunting" is probably more usual than it was ten years ago; this is due to improvements in aeroplane design—there is not so much tail-drag to keep the machine steady on its course.

Accelerations which are imperceptible to a passenger will put 5' or 10' of error into a sextant observation. Therefore, the more stable the machine the better. If the automatic pilot is in operation it makes a correction as soon as a yaw is started. In effect, this sets up another yaw. Capt. Bennett, of *Mercury*, tells me that he adjusts his automatic pilot until the hunting has a quick period; the sextant bubble then has an equally quick side-to-side movement, which makes it easy to place the observed star accurately in the middle. By this method he has no difficulty in obtaining his position by celestial observation within 2' of accuracy.

Our navigator is seated in a comfortable swivel chair fixed to the floor and placed at a suitably sized chart-table. Facing him at the other side of the table is an instrument panel. Among the instruments is a compass dial, which repeats the reading of a master compass. This latter is in the tail of the machine, where it will be least disturbed by magnetic influences. (Both pilots also should have vertical compass dials in the dashboard, each repeating from the master compass.) The navigator never has to leave his seat and scramble forward to look over the pilot's shoulder, nor need he distract his attention by shouting through a speaking tube to ask for a course. Besides the compass dial, he has an air-speed indicator, and an air temperature thermometer.

Fixed to the far edge of the chart-table is a movable arm with a parallel ruler attached, like that of the Chart Board Type "C," but with a greatly extended reach, so that the ruler can be moved to any position on the chart table without a change of its bearing. The chart-table has a specially prepared smooth surface; this will do away with the need for the use of padding under the chart to keep the drawings true. So that the chart can be held in position in rough air, the table is fitted with spring clips, with a rim round its edge.

At the side of the table, away from the window, is a fixed case for the sextant when this is not in use. There is then no risk of its being left on the table to be knocked off, or to fall off in bumpy weather—or, for that matter, of being left loose on the floor to be kicked.

The Library

There is also a container for his books and tables. Nothing is more distracting than to have a set of log-books flying round one's head in a bad bump. Some of the books carried are:—

The Air Pilot.
Relevant Nautical *Pilots* with the coast and harbour information necessary for flying boats.
A list of lights.
Notices to Airmen.
Air Almanac.
Necessary tables for solving the spherical triangle for celestial navigation and Great Circle flying.
Tables for refraction; and another which is badly needed, "Rate of Change of Altitude per Minute of Time, Given Latitude and Azimuth."
The best book he can buy for working out his sights, plotting position lines and intercepts, and working up his Dead Reckoning position.
Chart instruments—dividers, compasses, protractors and rulers.

He has a large drawer under the table to hold the charts, and also a rack for them beside the book container.

The navigator's seat faces one way only, namely, forwards; in this position he obtains a true sense of the machine's movements. One practical disadvantage of sitting sideways is that it makes some people feel sick.

To sum up, the picture that we must have of the navigator and his office is one in which we see him comfortably seated at his chart-table, a large window at one hand, duplicates of all the instruments which concern navigation set in a board in front of him, a radio loop goniometer within reach above the table, a drift-sight eyepiece beside him. Books, tables, the sextant and a slide rule, all well fitted into containers, are close by him. In addition, he must have a large chart-table on which he can work in comfort, a drawer for those chart instruments, work books, and log books which are in use at the moment, and a dome projecting through the roof from which he can take sextant sights at his ease.

Such complete equipment would at least have the effect of lessening the present number of accidents.

COMMERCIAL AVIATION

THE WEEK AT CROYDON

"A. Viator" Discusses the Retractability of Undercarriages, the Transportability of Foods—and the Hospitality of Scandinavia

ALL OUT FOR ACCURACY: A convincing three-ply mock-up of a K.L.M. Douglas fuselage in Warner Brothers' Teddington studios during the making of a new film, *Too Dangerous to Live*. Outdoor scenes have been made at Croydon with the co-operation of K.L.M., who have loaned all sorts of things from D.C.2s to pilots uniforms and a real live air hostess. K.L.M. executives, including Mr. Bert Prinsen-Geerligs, Mr. Anthony Squire and Capt. Spry Leverton, recently visited the studios to watch the "shooting." Incidentally, Warner Bros' assistant productions manager, Mr. Peter Bolton, was formerly a K.L.M. cadet.

PEOPLE at airports all over Europe, and doubtless in America, are amused at the sudden outcry here against the retractable undercarriage because of two or three minor mishaps—two of them with a new, untried type and the third leading to no harm, anyway.

Several reporters have asked me what was wrong with the retractable undercarriage in general.

"Dunno," says I. "Now I'll ask you one. How many Douglas and other well-known types in the world take off and land daily, using retractable undercarriages, and how many of them jam annually?"

The only figures I have at the moment are for a single airport, Schiphol, Amsterdam, where the majority of machines are modern and, therefore, retract their wheels. Departures of airliners during 1938 from Schiphol numbered 18,647, of which 10,984 were K.L.M. machines, which are practically all retracting as to the wheels. Undercarriage trouble, I believe, was nil.

Mind you, I don't say it isn't right to clamour for the abolition of the retractable landing gear, for safety first is a fine motto, and I am about to start a campaign for the replacement of all motor car tyres by solid ones. Look at the number of terrible punctures from which we suffer.

What with seagulls interfering with air traffic—and our new hangar which is now going up and which was actually designed for Langstone Harbour and is rumoured to be on floats—we are getting quite a nautical flavour at Croydon. Moreover, for the first time in our history we have a yardarm for the sun (if any) to go over, for the main strut, mast or brace is normally about 100ft. high. In fog or at night, and when a fat gull perches on it, the thing is lowered to 50ft. so that aeroplanes may land safely and all hands may brace themselves with a split bilge and soda, singing "Lower away there, bully boys all." This yardarm is, in fact, a crane.

Just prior to the departure of a giant (and all that) air liner a police car swept furiously into the airport with syren blaring and deposited a small and not frightfully jolly alien, who was promptly deported by air. Probably he felt highly honoured. It reminded me of Kipling's, "Once in a while we can finish in style, which I hope it won't happen to me."

Not long ago Imperial Airways brought to London 2cwt. of green peas of a succulent variety, grown in the Nile delta. Many such luxury foods frequently arrive by air. Properly organised, the air traffic in hitherto unattainable tropical fruits and vegetables should eventually attain huge proportions and it is already almost a regular thing for mangos to reach England in excellent condition from India by Imperial Airways and K.L.M.

I have just returned from a visit to Sweden by Swedish Air Lines' Douglas D.C.3. This company believes in minute attention to detail. When I was there I attended a remarkable lunch at the home of the Chief Engineer and his charming wife. Actually, it was four luncheons, and the idea was to choose which of a number of delicious Swedish dishes should form the menu on board the machines operating the Scandinavian Air Express.

Capt Carl Florman, chief of Swedish Air Lines, and several heads of departments, were present and one had to give marks, up to 10, to the best-liked dishes on the menu.

I also went to Helsingfors in Finland—and the Finns know something about hospitality.

Interesting to an Airport bloke is the snow problem, which we know little about here. They put little bushes on the surface of the snow just as flying-boat people put paper and things on the water, for snow may be as deceptive at times as water for landing—or as sand may be in the tropics. A splendid device shown me by Mr. Lignell, chief engineer of Swedish Air Lines, was an electric cabin heater, a few minutes' use of which warms the cabin to a cosy temperature before the take-off, after which, of course, the normal cabin heating takes over.

They all seem to speak perfect English in Stockholm, and only one tiny slip registered with me. A very charming lady, speaking of the lack of noise in the D.C.3 cabins, remarked that on a recent flight she had observed a young couple "whispering" to each other. Myself, I think that that word an admirable addition to our language.

A. VIATOR.

Brindisi-Baghdad

WHILE Haifa aerodrome is being enlarged by the provision of runways of a length of 700 to 800 metres, Ala Littoria have now put land planes on their tri-weekly Brindisi-Haifa service. Previously, flying boats were used. The land machines are Savoia Marchetti 75s and next month it is expected that this service will be extended to Baghdad, bringing this city within one-and-a-half days of London.

Commercial Aviation

JUDGMENT OF SOLOMON

The A.T.L.A. Holds the Balance Between Scottish Airways and Allied Airways

BY far the most interesting, and probably the most important, of the enquiries held by the Air Transport Licensing Authority has been that involving the rival claims of Scottish Airways and Allied Airways for the various services in the North of Scotland. For some years now those two strong individuals, Capt. Fresson and Mr. Gandar Dower, have been doing battle in that part of the world, and the fact that a year ago a new company, Scottish Airways, took over Capt. Fresson's Highland Airways has increased rather than decreased the tension.

In its findings the A.T.L.A. decided that competition was necessary for the best results. At the same time, however, it was realised that untrammelled competition might eventually, for economic reasons, cause the complete collapse of some of the services. Consequently, the Authority has held the balance carefully between the two companies and, certainly from the outsider's point of view, there is nothing to criticise in these findings. Allied Airways have, perhaps, been slightly favoured. In such circumstances one or other had to receive the benefit of what doubt there was, and it is just as well that the lesser of the two companies should be given this benefit.

Both companies applied for services between Inverness and the Shetlands, with intermediate landings at Wick and/or Thurso and on the mainland of Orkney; for services between Aberdeen and the Shetlands, with similar landings; for services between Aberdeen and the Shetlands direct; and for local services between Wick and/or Thurso, the mainland of Orkney and certain Orkney Islands. In addition, Scottish Airways applied for a service between Aberdeen and Stornoway, with an intermediate landing at Inverness, and for a service between Glasgow and Inverness with an intermediate landing at Perth.

During the hearings it became clear that the two parties were in substantial agreement about the services which should be operated, and the issue was narrowed down to the question of which should operate each. Until now more services had been operated than were commercially sound.

The Authority's decisions were based upon certain fundamental assumptions which were concerned with the use of the different aerodromes and with the arrangements for carriage of mails. Dyce aerodrome, at Aberdeen, is privately owned by Allied Airways, while Inverness is a public aerodrome. Because Dyce was privately owned, Scottish Airways have been using their own landing ground at Kintore. Wick has been a public-use aerodrome under the control of Scottish Airways, and Thurso a private-use aerodrome under the control of Allied Airways. Wideford (Kirkwall) is also a public-use aerodrome, but has been under the control of Scottish Airways, so that Allied Airways, in order to be freed of landing charges, have been using another field of their own whenever weather conditions permitted. Curiously enough, Thurso is a better starting point for both Kirkwall and Stromness, in the Orkneys, while it has been found that most of the passengers to the Shetlands come from Aberdeen, and most of those for the Orkneys come from Inverness.

The Authority has assumed the interavailability of Thurso, Wick, Wideford and Sumburgh to both companies, the continuance of the carriage of mails from Aberdeen and Inverness respectively to the Shetlands and the Orkneys; the obtainment of a public-use licence and radio facilities at Dyce; and the future collaboration between the two companies in the operation of the services.

The decisions have been influenced to a large extent by mail-carrying necessity. At present the Orkney mail is carried daily by Scottish Airways from Inverness, while the Shetland mail is carried by Allied Airways from Aberdeen on four days a week. In fixing the schedules it has been assumed that the mail contracts will continue.

This Summer's Services

During this summer each company will be licensed to operate a similar number of services per week from the mainland to Kirkwall and Sumburgh—one per day for each company to Kirkwall, and three per week for each company from Kirkwall to Sumburgh. Allied Airways, therefore, will be expected to sub-contract the Shetland mail to Scottish Airways on the three days on which that company is not running. Timetables, of course, will be arranged to suit the transference of mails.

Allied Airways will be granted a licence to operate an experimental service direct from Aberdeen to Sumburgh, while Scottish Airways will receive a similar licence for an experimental service between Aberdeen and Stornoway, with an intermediate landing at Inverness. They will not, of course, be entitled, on this service, to carry through-passengers to the Orkneys, via Inverness.

A service from Kirkwall to Wick will be licensed to Scottish Airways, and one from Stromness to Thurso licensed to Allied Airways. The main part of the Pentland Firth "ferry" traffic is between Thurso and Kirkwall, and until now, all this traffic has been carried by Allied Airways. Since Thurso aerodrome is now to be opened to Scottish Airways, licences for operation between these two points will, in all fairness, be granted on a basis of an equal share of the total number of journeys.

Scottish Airways will receive a licence for a service between Kirkwall, Sanday, Stronsay, Westray, Longhope and North Ronaldsay, with no limit to the number of services. Allied Airways will be permitted to stop at South Ronaldsay on their Pentland ferry service only.

The periods of the different licences vary from two years to seven years, with the shorter time for the experimental and "collaborative" services. In the latter case extensions will be offered when the Authority is satisfied that the companies are working amicably together.

Pacific Plans

REPORTS on the starting dates of Pan-American's San Francisco-Auckland and Imperial Airways' Sydney-Auckland services are still conflicting, but the latest moves suggest that August and October have probably been chosen. P.A.A. announces that its trans-Pacific service will not be inaugurated until its Boeing 314 Clippers have started regular services between New York and France, and between San Francisco and Manila.

The new machines are expected to be in operation on these services by July at the latest, so that the opening of the America-New Zealand service will probably be about a month afterwards, allowing time for the completion of ground organisation, and the making of two or three preliminary flights.

On the Tasman question, October still seems the most reasonable forecast. The construction of the temporary buildings at the Auckland base is expected to be completed this month, but, even so, it does not seem possible that the entire ground organisation, including radio and meteorological services, could be fully installed and tested before October. Only last month the first step in establishing a chain of radio and weather stations across the Tasman was taken by the appointment of observers and operators to Lord Howe and Norfolk Islands by the Australian Government.

It is now being suggested in Australia, however, that both services will be inaugurated in October, and that the present projected routes will be changed. Pan-American, it is said, may come direct to Australia by way of the Phœnix Group and New Caledonia, leaving the Auckland-Suva-Honolulu line to Imperial Airways. In this case, it is thought, Pan-America would obtain permission from France to establish a landing base at Saigon in Indo-China.

Meanwhile, twenty-eight meteorological observers have been appointed by the Australian Government to aerodromes in all the States, the Federal Capital Territory, New Guinea, Papua, the Northern Territory, and Lord Howe and Norfolk Islands, which are under Australian administration. Their appointment represents the first stage of a plan evolved by the Commonwealth Department of the Interior to develop a complete service for the benefit, mainly, of civil aviation. Under the plan, three observers and three radio operators will eventually be stationed at every important aerodrome and a continuous 24-hour service will be maintained.

The object of establishing weather stations on Lord Howe and Norfolk Islands is, of course, to assist in the projected Sydney-Auckland service.

Reshuffle

ALTHOUGH it is customary still to speak and to think of the "railway octopus" in internal air transport affairs, this at least partly imaginary polyp appears now to have split up into two. Railway Air Services may, in fact, be considered as being almost exclusively L.M.S., while the Great Western and Southern Railway interests are concerned, as its name implies, with Great Western and Southern Air Lines. In the latter organisation is incorporated Channel Air Ferries, and both Captain Olley and Lord Amherst are importantly concerned with both. G.W.S.A.L. handle all the railway air

travel in the south-west and south districts of the country.

As another indication of the way in which things are moving, there is Co-ordinated Inland Airlines—a company formed by South Eastern Airways with the idea of close collaboration between, if not a merging of, all the other internal airline interests.

Meanwhile an interesting new company has been formed in Edinburgh. This is known as Night Air Transport, and its plans are to fly night services, freight, mails, and, if the demand is sufficient, passengers between Scotland (Grangemouth) and London. The directors are Sqn. Ldr. D. F. McIntyre and Mr. W. A. Scott Douglas, the first of whom is a director of Scottish Aviation, the firm which is responsible for the new Grangemouth aerodrome.

Licensing the South and West

THREE companies heard the decisions of the Air Transport Licensing Authority last week. These three—Great Western and Southern Air Lines, Western Airways, and Lundy and Atlantic Coast Air Lines—are, of course, concerned exclusively with operations in the south and west of England. The first named company is new in name, though not in fact. Some time ago, it will be remembered, Railway Air Services took an interest in Channel Air Ferries, and G.W.S.A.L. covers the field previously held separately by R.A.S. and Channel Air Ferries.

They have received five years' licences for services between Shoreham (Brighton) and Manchester, with landings at Ryde, Southampton, Bristol and Birmingham; for a service between Shoreham and Bristol with landings at Ryde and Bournemouth; and for a service between Shoreham and Bournemouth with landings at Ryde. A seven years' licence has been offered for the Penzance-Scilly Islands service, and another for the route between Heston and Ryde, with landings at Croydon. Additionally a three years' licence, for the summer months only, has been given to G.W.S.A.L. for a service between Bristol and Land's End with landings at Exeter and Plymouth.

Western Airways, now, of course, owned by the Straight Corporation, have received three-year licences for services between Bristol and Swansea with landings at Cardiff, and for an experimental service between Swansea and a landing ground at Hayle, in West Cornwall—with intermediate landings at Bristol and Newquay. The licence for the Cardiff and Weston-super-Mare ferry service is for seven years.

Finally, Lundy and Atlantic Coast Air Lines have received a seven year's licence for their service between Barnstaple and Lundy Island.

Eight a Day

PROVIDED that the necessary flying equipment is available, Imperial Airways will, probably, in co-operation with British Airways, be running eight return services to Paris during this summer. The new schedule, which involves a departure from Victoria every two hours between 8 a.m. and 10 p.m. and a similar departure from the offices in Paris every two hours between 6.15 a.m. and 8.15 p.m., should come into force early in April.

The whole thing depends, it seems, on the use of D.H. Albatross, or "F" class, machines for which a London-Paris flying time of 1 hr. 10 min. can safely be allowed. In fact, the machines of this type usually cover the distance in very little more than an hour.

A fortnight ago Imperial Airways ordered two more of these machines and both of them should be in service within about three months. The first is actually flying, but there is naturally a good deal of interior work to be done before it can be put on the route. Even with five D.H.91's it would be possible for Imperial Airways to run the expected every-two-hours-on-the-hour service to Paris as well as one to Zurich—though it is possible that the Budapest run will for various reasons take prior place.

Knowing that Imperial Airways have been somewhat short of up-to-date flying equipment, the Air Ministry have arranged to let them use the two Albatross machines which were originally destined for Atlantic crossings. This does not mean that the landplane experiments have been indefinitely postponed, but merely that the machines will be more useful on European services.

Still at Work

WITH the continuation of the war in China it has been difficult to discover exactly what is still being done by the two major airline companies in that country—China National Aviation Corporation and the Eurasia Aviation Corporation.

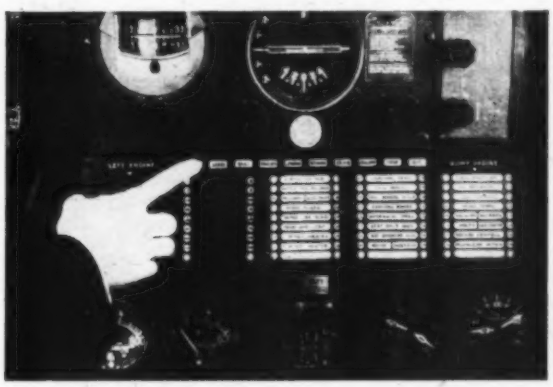
At the end of 1937 C.N.A.C. moved their headquarters from Shanghai to Chungking, and at present maintains services from this base over five routes. These are to Kunming (Yunnan); to Ichang (the western Hupeh trading town beside the Yangtze); to Chengtu (the capital of Szechuan); to Kiating (the commercial centre of Szechuan); and to Hong Kong. The latter service has been operated somewhat irregularly since one of the C.N.A.C. machines was shot down by Japanese fighters last September.

The machines used by the C.N.A.C. include Douglas D.C.2s, Stinson Trimotors, Loening amphibians and Consolidated Commodores. Preparations are now being made for the opening of two new routes, one between Chungking and Hanoi (in French Indo-China) and the other between Chungking and Tihua (the provincial capital of Sinkiang or Chinese Turkestan). The former service is concerned with the pool arrangements with Imperial Airways. It is understood that Imperials will rearrange their Rangoon-Hongkong line to run via Kunming, while C.N.A.C. will operate bi-weekly from Chungking to Rangoon, stops being made at Kunming, Lashio and Mandalay. C.N.A.C. already maintain a bi-weekly night service between Hongkong and Chungking.

The Eurasia Aviation Corporation, which was established jointly by the Chinese Government and the German D.L.H. in 1931, has probably suffered more severely from the present conditions, only two-thirds of the pre-war route length now being operated. The present services include those between Chungking, Kweilin and Kunming; between Chungking and Kunming; between Kunming and Ninghsia; between Chungking and Chengtu; between Kunming and Lanchow; between Chungking and Hanoi; and between Changking and Hong Kong. When the company was originally formed the idea was to extend the services westward until such a time as a through run could be organised between Germany and Shanghai. Because of the unsuitable conditions in Sinkiang, however, the final destination of the E.A.C., Urga, has never been reached.

Check and Re-check

NOWADAYS there are a tremendous number of details to be looked after by the pilots of any modern transport aeroplane. It is usual, therefore, when a crew is becoming accustomed to a machine, to type out the sequence of operations and the various checks for the take-off and approach, and to paste up this list in some prominent place in the control cabin. Later on it is supposed that the pilot will remember everything, and no further reminders are therefore offered.



The operational tell-tale panel on the Curtiss Wright 20 as it appears in experimental form. It is placed immediately below the Sperry panel and, consequently, in full view of both the first and second pilots.

In the new Curtiss Wright 20 a complete and automatic tell-tale panel has been incorporated in the dashboard. In its essentials this consists of a series of lights which are electrically connected to the various operating parts of the machine in such a way that their functioning is duly indicated. Before making an approach to land, for instance, the pilot presses one of the ten pre-selector switches—marked, in the case, "land." Lights show on the tell-tale panel to indicate those operations which have to be carried out. As the landing gear is lowered, the appropriate light goes out and the same applies to the flaps and trimming items. When the panel is completely dark, therefore, no further adjustments are necessary. Somewhat similar series of lights are used for checking the functioning of the power units, so that the various readings of temperature and pressure, as well as mixture condition and airscrew pitch, can be checked in sequence.

Such a tell-tale panel should relieve the pilot of a good deal of responsibility and so reduce his mental fatigue in normal flight.

Private Flying

FROM the CLUBS and SCHOOLS

Flying and Social Activities : C.A.G. News

LONDON.
LAST week Miss Y. Medlicott and Messrs. J. W. Boote, R. A. Richardson, and R. Bruton made their first solo flights, and a flying total of 103 hr. 25 min. was put in. Messrs. A. H. N. Woolcott and M. Seteanu completed their "B" licence night flights.

HYDERABAD.
During January a total of 76 hr. 45 min. was put in. This included several long-distance cross-country flights.

NORTH BRITISH.
Although there was no flying on three days of last week on account of high winds and rain, 22 hr. 35 min. was spent in the air by Civil Air Guard members.

STRATHTAY.
For the week ended February 19 a total of 30 hr. flying was recorded. The weather is still extremely bad and has been seriously interfering with the "A" licence test plans.

BARTON (BEDS).
There are vacancies in the Civil Air Guard section of the school. Messrs. N. F. Jordan, A. R. W. Jordan, and R. A. Palmer have gone solo, and several new members have joined.

REDHILL.
The club dance, which was held last week, proved very successful. Messrs. W. H. Whiting and W. T. Monk have made their first solos, and flying for last week amounted to 77 hr. 15 min.

DONCASTER.
During the week ended February 24 a total of 33 hr. 54 min. was flown, and Messrs. Wigglesworth, Harper, and Copley went solo, while Messrs. Ogilvie, Pease, and Landers completed their "A" licence tests.

JOHANNESBURG
A total of 585 hours was put in during December and two pilots made their first solos. Two "A" licences were also obtained. A number of cross-country flights were made, including one to Cape Town via Durban.

THANET.
Although only four days were available for instruction, this club put up the excellent total of 114 hours last week—a "tie" with Ipswich for the Straight Corporation record. Miss Burke and C. Samuel made their first solo flights.

MARSHALL'S.
Miss R. Roper and Messrs. Dickinson, Fisher, Savory, Tomkin, Turner, and Wass made their first solos last week, and Messrs. Addinsell and Trillwood completed their "A" licence tests. The total flying amounted to 105 hr. 40 min.

PORTSMOUTH.
A total of 135 hr. 30 min. flying was put in by the Portsmouth Aero Club for the three and a half weeks ended February 25. Of this, C.A.G. members contributed 66 hr. 20 min. Fifteen members have now qualified for their "A" licences.

KARACHI.
Cross-country flights to Delhi were made during January and in all 243 hr. 55 min. flying was done during the month. Messrs. Rawal, Naidu and Salukhe completed their "A" licence tests and Mr. H. B. Mistry has obtained his "A-1" licence.

YORKSHIRE.
The flying hours put in during February up to the 24th have constituted a record for the month as compared with other years. So far 255 hours have been logged, the total flying for last week having been 136 hours. The previous Sunday 34 hours were put in.

WESTON.
Flying time leapt up to 61 hours last week, though only five days were suitable. The spate of "A" licences continues, and Messrs. P. F. Warrilow, A. C. H. Dennis, R. T. Styles, and J. D. Watts qualified last week. Mr. I. S. Fossett made his first solo flight.

NEWCASTLE.
Although there was no flying on three days of the last fortnight, the total flying amounted to 117½ hours, of which 97 hours represented C.A.G. flying. Messrs. H. Gibson, H. Lewis, and F. Dougall went solo, and Mr. S. Stokes and Mrs. E. Lister passed their R.A.C. tests.

CINQUE PORTS.
During last week Messrs. D. G. Clark, A. J. Howard, and Stiles obtained their "A" licences under the C.A.G. scheme. The Marquis Saurez d'Aulan, one of the oldest members from France, called in at the club on his way back to Paris. Fifty-four hours were spent in the air.

YAPTON.
During the period from February 1 to February 25 a total of 13 hr. 45 min. was flown by C.A.G. members. There are now 64 members under instruction, and four have qualified for their "A" licences. In the club section 20 hr. 5 min. was flown over that same period.

WORCESTER.
During the week ended February 25 high winds cut down the flying time to 25 hr. 45 min. Advantage was taken of one good day, during which Messrs. A. P. Jones and T. C. H. Sanderson carried out first solos and Mr. Mitchell-Cotts finished his "A" licence tests.

EXETER.
With a week of fair weather, with the exception of one day, the flying time totalled 63 hours. This was more than double that of the previous week, and showed what the club can do with two machines if the weather is helpful. Messrs. F. Gibbs and C. D. Buchanan made their first solo flights.

YORK AND LEEMING.
C.A.G. members undertook cross-country flights to Brough and Hull, and flying amounted to 54 hours. Messrs. L. W. Chatto, C. E. Stamp, and M. Hudson completed their "A" licence tests, while Mr. E. S. Shepherd made his first solo. The club held a successful dinner dance at Harrogate on February 24.

IPSWICH.
In spite of the windy weather the Hillsons have been flying every day, and last week's flying time was again a record—114½ hours. Messrs. L. Corder, A. H. Pharoah, A. W. Laxen, and R. F. Hitchcock passed their "A" licence tests, and Messrs. P. Cox, S. J. Wrinch, A. Mitchell, and T. W. Phillips made their first solo flights.

HERTS AND ESSEX.
The flying total for the fortnight ended February 23 was 180 hr. 45 min. Mr. A. E. Foster, a club member, went solo, while in the Civil Air Guard section Mr. M. Goff made his first solo and Messrs. R. H. Walling, J. Harrison, J. Haker, L. H. Such, F. G. Smith, L. H. T. Capel, C. Reeves, F. E. Johnson, E. R. Cornish, W. Cramer, and S. H. Murray completed their "A" licence tests.

NORFOLK AND NORWICH.
Mr. Henderson gave a lecture on "The Theory of Flight" to the second-class members of the C.A.G.; it was attended by some fifty pupils. Just over 40 hours' flying was put in last week, and three pupils made their first solos and completed their "A" licence tests. In the absence of Mr. A. E. Firmin, Mr. G. M. Hick took charge of the gliding section. The primary trainer has been re-rigged.

PLYMOUTH.
Last week's flying time was 76 hours—a good performance with 2½ days unsuitable for flying. Owing to its altitude (460ft.), this airport suffers a good deal from low cloud, but it is not subject to flooding. The clubhouse and restaurant extensions are now complete and are a very great improvement. Mr. S. Rivers has passed his "A" licence tests, and Mr. R. J. B. Trim has made his first solo flight.

ROMFORD.
Enthusiasm, particularly in the National Women's Air Reserve and the Civil Air Guard, is making Chigwell aerodrome one of the busier centres, and last week 84 hours were logged. Messrs. Barlow and Winscheffel qualified for their "A" licences, while Messrs. Saunders and Mason went solo. In order to raise funds for their "B" licence scholarship the N.W.A.R. put on a revue, with two or three very amusing skits, at Maylands aerodrome.

BRISTOL AND WESSEX.
Cross-country flights to Shoreham, Worcester, Liverpool, Reading, and Brooklands were included in the flying time of 123 hr. 10 min. which was logged during the first three weeks of the month. During January, 48 hr. were flown. A new series of lectures for C.A.G. members will start on March 7. The total C.A.G. enrolments to date, incidentally, amount to 85. Messrs. D. W. Brokenbrow and N. J. Durrant have made their first solos, and Señor R. Rosas has obtained his "A" licence.

SOUTH COAST.
On Sunday, March 5, the first of a series of tea dances will be held, and on the following Sunday, March 12, a "goodwill" flight is being arranged to the Eastbourne Flying Club at Wilmington, where members of the flight will stay to lunch. The dinner jacket dance, which was held last Saturday, was a success. Meanwhile, two C.A.G. members have proved themselves, one, Mr. A. de Baughn, qualifying for his "A" licence, and the other, Miss F. Bradford, flying solo. Thirty-six hours' flying was put in during last week.

MADRAS.
January added its thirty-one cool summer days to the relentless drought that should have been the Carnatic's annual rainy season. A cyclone, hopefully coming to birth in the south of the Bay early in the month, ponderously surged its stormy way towards Madras, but collapsed and filled in, so that it only bestowed on the aerodrome a few light showers, with a meagre crop of pathetic little mushrooms to chant its obsequies. At the end of the month the club held a bombing competition. Weighted message bags were dropped from 400ft. at a target 30 yd. across, the winner being Mr. T. M. Doraiswamy with full marks; Messrs. Italia, Fernando and Balasingham tied for second place. The dying cyclone laid a trap for aviators in the form of a cloud-with-rain screen over the hills. This caused the tragic accident to the Tata machine in which Mr. S. H. Engineer lost his life.

STANDARD—WITH DIFFERENCES

The New Piper Cub Coupe Described : A Conventional American Lightweight in which Roominess and Comfort have been Studied : Some Flying Impressions

"Flight" photograph.

NOW that the Cub is obtainable in side-by-side-seater form, the three best-known American lightweights can be said to have settled down to an absolutely standard layout. For a long time the low-powered machines produced in America have, so far as price and design considerations allowed, been miniatures of the larger types which have been popular over there during the last decade. Fortunately, even though these lightweights are similar in general layout and construction, certain differences in handling qualities and accommodation can still be found.

The most notable change during the past year or so has been the result of the appearance of slightly more powerful engines, and the new lightweights have a much better take-off and climb than their forerunners, which were for the most part fitted with 40 h.p. engines. Nor is it so much a matter of an additional 10 h.p. The new engines are designed to run at comparatively low revolutions—the Continental A-50, for instance, cruises at 1,700 r.p.m.—and this permits the use of a large-diameter airscrew which very much increases the low-speed pulling powers.

Composite Construction

In every way to-day's lightweights follow what can only be called "Reliant" practice. They are high-wing strut-braced monoplanes in which the wing is of wood, while the fuselage is of welded steel, and the details of resemblance include even the use of a roof-mounted crank for trimming. In the new Cub Coupé the manufacturers have gone as far as to provide controllable cabin heating. Unusually enough, the standard equipment of the machine includes navigation lights with the necessary battery, as well as hydraulic wheel-brakes.

One's first impressions when in this new Piper Cub are that the view in essential directions is better than that to which one is accustomed with this type of machine, and that there is plenty of room inside. Figures give a very poor impression of spaciousness as such, and it is more useful to say that two full-sized people can sit in the machine without being cramped or interfering with one another in the least. Furthermore, there is ample headroom for the tallest passenger or pilot.

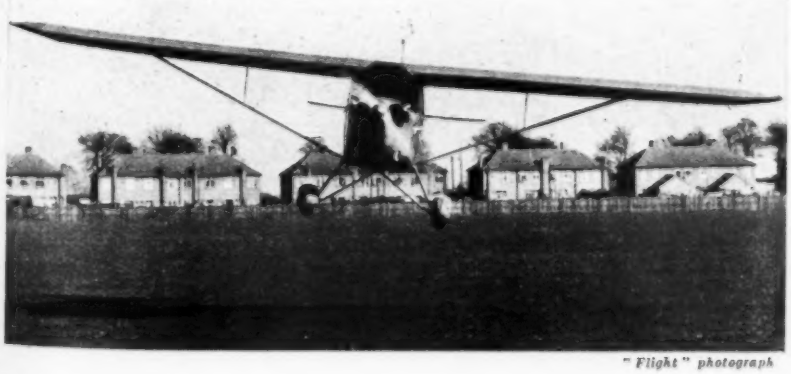
The moulded screen is deep and the seat positions are such that, even when the tail is down, it is possible to see over the nose, while in level flight the cowling is very well below the horizon. The side windows extend rearwards so that a full view of the surrounding space can be scanned before making a turn. There is a small window in the roof, but this is not big enough to enable the pilot to see whether any other machine is coming in before he opens the throttle for the take-off, and the brakes prove to be almost entirely necessary for a quick look round. The doors are reasonably wide, and with the help of a little step on the undercarriage the job of entering the machine is simpler than usual. Best of all, there is quite ample luggage space behind the two seats, and as much as 105 lb. can be taken—though I should feel doubtful about the advisability of carrying as great a load as this in really bumpy weather.

Car-Fashion

The dashboard layout follows the present idea of making the inside of an aeroplane as much like the familiar car as possible. The vertical-reading compass is mounted at the top of the dash, in the centre, while a turret-type fuel gauge is carried inside the screen on the top cowling.

As a flying machine the Cub Coupé can best be described as typically American, with all the advantages and disadvantages of the type. To English hands and feet the machine is almost too easy to fly. For the take-off one merely gets the tail well off the ground and then "feels" the stick rearwards until the machine is air-borne at the lowest possible speed. When I flew the machine the trimming gear was not working properly, since the tab mechanism had been damaged while the machine was on the ground. It was not possible, therefore, to trim the machine to a suitable glide at the correct speed, and it was necessary to hold the nose up during the approach. This is normally made at an air speed of about 50-55 m.p.h., which leaves ample reserve for the hold-off and landing without causing over-correction. At this speed the machine almost lands itself and the oleo undercarriage would probably take any normal sink or wheeler without informing the occupants.

For approach adjustment the Coupé side-slips very effectively, though there is not enough rudder control to keep the speed down if too steep a slip is attempted. In the ordinary way it is better to hold the nose up and to crab the machine gently, using enough aileron to prevent a turn. Curiously enough—at least in machines of this size—rumbling tactics work admirably, and with just a whiff of engine the machine will carry on in a constant fore-and-aft attitude at any air speed between 50 and 60 m.p.h. according to the trim. The stall is as harmless as would be expected. The controls would not, by English standards, be considered to be very well harmonised, since the ailerons are heavy and the rudder very light. Some of the aileron heaviness



"Flight" photograph

Despite the useful cabin width and the fact that it is a braced high-wing machine, this frontal view shows that the Cub Coupé has comparatively clean lines. The photographer escaped with his life.

could, in this case, be attributed to newness and stiff bearings.

The hydraulic brakes are very smooth and effective and, with luggage aboard, it should be possible to make full use of them when landing in a small field. When I tried really hard braking, with the machine in a lightly loaded condition, the tail came up a little towards the end of the run, though full elevator and a little engine might have prevented it from doing so. With a machine landing at 35 m.p.h., the main use of wheel brakes is obviously for manœuvring on the ground.

Contrary to expectations, the heel-operated brake pedals, which are arranged just below the rudder pedals, can really be used without discomfort. In the majority of American types these pedals always appear to be placed in a most awkward possible position. One reasonable criticism is that no provision is offered for parking—which, when starting up the engine single-handed, is one of the more important uses of wheel brakes. Presumably, it would be easily possible to rig up some additional wire control for this purpose. In the same way a second throttle could be fitted on the pilot's left side for training purposes in this country. The average pilot over here is not very accustomed to flying with his left hand and working the throttle with his right. In this case the throttle is of the conventional (in America) centrally disposed push-rod type, which can be set firmly by means of an adjustment flange in any position for long-period cruising.

Although at 1,700 r.p.m. the Cub Coupé is reasonably quiet, it is certainly not as quiet as it could be, and experiments with window fittings and so forth show that most of the noise is of an unnecessary character. Again, too, the sliding windows tend to open in flight and a little catch on each side would prevent this and, at the same time, reduce the noise.

In standard form the machine carries a twelve-gallon tank, though a fifteen-gallon tank can be fitted if required. At cruising revolutions the Continental should use very little more than three gallons an hour and the still-air range should, therefore, be rather more than 300 miles. H. A. T.

PIPER CUB COUPÉ.

50 h.p. Continental A.50 Engine.

Span	36ft. 2in.
Length	22ft. 6in.
Weight empty	710 lb.
All-up weight	1,200 lb.
Maximum speed	93 m.p.h.
Cruising speed	83 m.p.h.
Landing speed	35 m.p.h.
Cruising range (15-gall. tank)	340 miles

Price (at normal exchange rate): £590.

Concessionnaire—A. J. Waiter, 37, Lancaster Close, St. Petersburgh Place, London, W.2.

The Manx Air Races

AFTER a somewhat stormy meeting recently, the Douglas Corporation decided to continue the annual grant for the Manx Air Races, which will be held this year as usual. The London-Douglas race will be held, as before, on Whit Saturday, May 27, while the two Island races will be held on the following Monday. The only change in the arrangements is that foreign competitors in future will not receive special financial assistance.

S.B.A.C. Scholarships

INTENDING candidates for the S.B.A.C. Scholarships to the aircraft industry are reminded that entries close on February 28. Candidates must be between the ages of 16 and 18 on September 1, 1939, and must have been educated up to matriculation standard or its equivalent. Forms may be obtained from the Secretary, The Royal Aeronautical Society, 7, Albemarle Street, London, W.1.

Keeping Up the Interest

WHEN the new Brooklands flying club committee was elected in January of last year, they started work with the idea that there must not be a single week-end in which something out of the ordinary is not arranged at Brooklands—something, that is, which is of interest both to flying and non-flying members. The result has been that the year 1938 was one of record activity at Brooklands.

In previous years, competition entry lists have not been too good and the view taken by the committee was that members with less experience were discouraged from entering. In order to level matters up it was decided that all competitions would in future be on a handicap basis. Altogether, eight competitions of various kinds were flown off during the summer season and entries were more than double. At the end of the period the marked score of the handicap by each competitor was totalled up and the member with the largest aggregate was presented with the Ted Jones Trophy—the winner for 1938 being Mr. C. Nepean Bishop.

The original Brooklands idea of the dawn patrol continued to be popular and these events caused certain flying members to become quite efficient in formation flying. In fact, at the annual garden party, which was revived in June, three members gave what was probably the first definitely amateur display of this kind of flying.

The other outstanding events of the year were the Four Club competition for the Doncaster Trophy, which was won by the Brooklands team, and the Gosport reunion, under the chairmanship of Col. Smith-Barry, A.F.C.

All three of these major events will be held again during this summer, for which somewhat similar plans have been laid down.

Although Brooklands has not started a Civil Air Guard section, a squadron (No. 11) of the Air Defence Cadet Squadron was formed there last year.

Competition in East Africa

ON January 29 the Aero Club of East Africa flew off to its annual flying events at Nairobi. The first of these, for the Mitchell Cup, is designed for the comparative novice, no pilot of more than 50 hours being permitted to compete, and consisted of a spot landing more or less on the lines of the British "A" licence flying test. In this case the winner was Mr. T. R. King, flying a Gipsy Major, and he completed his tenth solo hour in the process.

The second event was an air race over two laps of a fourteen-and-a-half mile triangular course. This was flown on a handicap, and was won by Mr. N. Gladwell, flying a Puss Moth, in 15 min. 55 sec. (105 m.p.h.). The scratch starter, Mr. W. C. Mitchell, flying a Miles Hawk Major, came in second with a time of 12 min. 48 sec.—an average speed of 137 m.p.h.

Extensions at Woodford

WHILE, following a recent decision by the Air Ministry, the aerodrome at Woodford is being extended in spite of the opposition of the local Town Planning Authority, and new offices and an erection shop are being built for A. V. Roe and Company, the Lancashire Aero Club is extending in a different dimension.

It is always worth remembering that Service and other visitors make good use of the Lancashire Club's premises, without which the aerodrome would have a somewhat different aspect.

More than 120 C.A.G. members are at present attached to the club, which has five instructional machines in use—three Avro Cadets and two Avro Avians. In due course a couple of Moth Minors are to be acquired, while there is still a Hornet Moth available for the use of club members. Each week there are three ground classes of forty C.A.G. members on Tuesdays, Wednesdays and Thursdays, and thirty-two "A" licences have already been obtained.

More than 200 guests were present at the club's annual dinner held on February 10, at the Grand Hotel, Manchester, and nearly 2,000 guests attended the first annual dance of the Manchester C.A.G., which was held on February 16. This affair was organised together by the Lancashire Aero Club and the Northern Aviation School and Club—the first of which operates at Woodford and the second at Barton. Among the speakers, Major Alan Goodfellow, who is the Commissioner for the north-western area, said that nearly 2,000 members were on the waiting list at Woodford and Barton. Though it is less than six months since the scheme started, "A" licenses have been gained at a surprisingly high rate, and he was looking forward to the issue of more than a score of licenses every day later this year.

In the meantime, a scheme to train an Auxiliary Air Force squadron and to set up a Volunteer Reserve School for Ringway has been approved by the Airport Committee. As at Barton, the work will be confined to the training of pilots for the R.A.F.V.R., while the A.A.F. squadron will be regarded as a feeder unit to various branches of the Service.

TOPICS of the DAY

The Ha'porth of Tar

WITH all the sympathy in the world for the patient, downtrodden, and almost entirely unassisted aerodrome owners, one cannot help feeling that their efforts sometimes have been of a penny-wiseish nature. Their difficulties are obvious. They must first approach the ratepayers and explain how much their particular size of aerodrome will cost, and then, afterwards, when they find that the incidentals have mounted up, they are afraid to ask their supporters for some more money. Afraid, of course, largely for political or semi-political reasons.

The result is that, after spending anything up to six figures or more on an aerodrome site and layout, the airport committees find themselves unable to spend two or three thousand pounds more on the provision of essential additional facilities. Nowadays any kind of good landing area can always be used by the R.A.F. Reserve, but the airline operator demands a good deal more than a mere landing ground.

Obviously, a municipality which does not feel that its aerodrome is likely to be used by commercial operators is wasting time and money in the provision, for instance, of full night-landing equipment. Nevertheless, without such equipment it is practically impossible for airline, or even charter, companies to make serious use of an aerodrome.

In a general way it might be suggested that a municipality, when it has decided that the provision of an aerodrome is a good thing, should make up its mind whether to provide everything or nothing. If a mere landing area is offered, it may remain a bare and often almost derelict affair for a number of years, whereas the provision of a really good terminal building and of full night-landing equipment will encourage both operators and schools to make the fullest possible use of the aerodrome.

Internal Complaints

PEOPLE often complain bitterly of the uselessness of some of our internal air services. This comparative uselessness is concerned partly with time-table arrangements and partly with the infrequency of the services in comparison with those offered by the ground transport organisations, but mainly with the fact that little or no night flying is carried out. While airlines operate only during daylight, the more cautious or less interested passengers will go by train and boat and sometimes arrive at their destination while the airline passenger is waiting for the next morning's departure.

It is all very well to criticise the operators, but how many aerodromes in this country are equipped for night take-offs and landings? Something like half a dozen, if the Government-owned airports are excluded.

Lighting equipment is certainly expensive, but the cost is positively trivial in comparison with that of laying out the aerodrome itself. And a town which, as I have said before, will spend a sum running perhaps into hundreds of thousands on an aerodrome and then go all economical about a few odd thousands seems to me to be missing the way rather badly. If the local people are not prepared to go to the limit in airport development, then it will often be better, perhaps, if they never start at all—though a site should be reserved for the future.

Of course, a great deal of this municipal airport building is carried out in an atmosphere of inter-city rivalry. Puddlewick has an airport, therefore Bumbletown must obviously have one too. The fact that neither of them has the money to produce an aerodrome which is fit for use by all and sundry is overlooked, and neither, apparently, considers very seriously that co-operation might result in the appearance of one really good aerodrome.

In the meantime it is somewhat natural for the Air Ministry to increase the magnitude of their runway suggestions in the matter of aerodrome size. It is to their advantage to have the biggest possible aerodromes in the greatest number of places, and just now the people at the Air Ministry have reason to be grateful for those municipalities which have spent large sums of money with very little hope of a return within the lifetime of its ratepayers.

By the way, some final statement should be made as soon as possible about the Langstone Harbour and/or other air base schemes. Some quite incredibly unkind and even libellous stories are being circulated about the reasons for the fact that the Langstone plan, for instance, has been jumped on.

Nobody believes that the Admiralty's objections were anything more than a temporary cover for others of a different nature which have been found by the Air Ministry. And everybody knows that Imperial Airways would much rather operate from a place like Langstone Harbour than from a small, busy, turbulent, and bottle-strewn area in Southampton Water.

On the face of it there is no question about the comparative suitability of the two bases. If some decision and statement is not made shortly there may be a large explosion and a good deal of embarrassing linen-washing. At least, that is how it appears to me.

Expansion Incidentals

QUITE apart from the fact that the expansion scheme has meant that practically all manufacturing energies are directed into military channels (with a consequent lack

of civil aircraft developments), this same expansion scheme is holding back quite a considerable amount of useful incidental material.

Within the last year or two, for instance, the R.A.F. has suddenly discovered that wireless can be used for something more than the unimportant interchange of remarks. The consequence is that a great many new and useful devices in the world of wireless are being kept back from the civil people. The latter are not likely to see any really outstanding new development in direction finding for at least two or three years. I can think of one or two advanced ideas of tremendous importance about which many of the civil people are entirely ignorant.

This, one supposes, is as it should be. It is, however, hard not only on the operators and pilots, but on the manufacturers of radio equipment. Presumably, it pays them to keep certain work only for the Air Ministry, but if their latest items of equipment had a chance of world-wide sale in other markets it would be better for all concerned. Certainly, no civil organisation could cause the trouble, anxiety, and delay which is almost daily caused by the Air Ministry.

Whereas the ordinary civil pilot or operator jumps at the chance of seeing and using any new device, the Air Ministry experts suffer from the most prodigious, though natural, suspicion of all new-fangled things, and it takes them anything up to two years to make up their minds about them. At that point, having made up their minds, no other device, however much better it may be, can then be considered for another two years.

Still, we must, I suppose, be grateful for the fact that wireless, in its more useful applications, has been officially "found"—just as, a year or two ago, the bubble sextant was duly discovered.

Recently one of our best-known charter pilots visited the Air Ministry to be interviewed by certain people concerned with a branch of the Royal Air Force Reserve. During this interview one of the officials remarked that "he noticed that Capt. Blank had a Second Class Navigator's Licence; what was this licence?" The charter pilot explained as well as he could, and was then asked how and where such a licence could be obtained. On hearing that it was issued by the Air Ministry the official expressed both surprise and interest. INDICATOR.

"Flight" Index

THE index to the July-December, 1938, volume of *Flight* is now available and is obtainable at 7d., including postage, from the Flight Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1.

Binding cases are also available and are supplied, together with an index, at 4s. 4d., postage included

Atlantic Personnel

SECOND in command with Paul Codos and chief navigator on this year's series of Air France experimental substratospheric flights across the North Atlantic between Bordeaux and New York, will be Rene Charpentier. Evidently the age of 43 is not considered too high for such a job. Three Farman landplanes of the *Laurent Guerrero* type, fitted with pressure cabins, are being prepared.

Charpentier's single-handed job for the past eleven years has been to fly backwards and forwards across the Jura Mountains between the Cointrin airport at Geneva and Lyons airport.

Figures just published by Air France for this run show that the best results of all the minor services run by the company were achieved last year; 10,841 passengers were carried, against 3,265 in 1937.

Lightweight Seaplane Record

FOLLOWING the recent flight by an Aeronca Chief across the American Continent, another somewhat similar record has now been put up by a Taylorcraft on floats. This machine, which was powered with a 50 h.p. Lycoming engine, flew non-stop from New York to Daytona, a distance of 902 miles, on January 7, thus setting up a new international record.

The pilot, Mr. D. Eldred, actually flew 975 miles, though the straight-line distance is, of course, that for which he will be credited. He took off from Port Washington at 8.10 a.m. and was in the air for 13 hr. 45 min. The flight was made in connection with the annual light aircraft rally at Miami. At the moment of take-off the machine, with its extra fuel tankage in the floats and with a fifteen-stone pilot, had a gross weight of 1,435 lb.

London Chamber of Commerce Aviation Section

AT the annual meeting of the Civil Aviation Section of the London Chamber of Commerce, held recently, Lt. Gen. Sir George Macdonogh, G.B.E., K.C.B., K.C.M.G., was re-elected chairman for the year 1939 In addition, A.V.-M. A. E. Borton, C.B., C.M.G., D.S.O., A.F.C., and Mr. O. E. Simmonds, M.P., were elected deputy chairmen, the latter taking the place of Lord Greenway, who has resigned.

Kilocycles in Future

ON and after the first day of this month radio wavelengths in the aeronautical services are designated by their frequency in kilocycles per second or megacycles per second. Actual wavelengths in metres will no longer be mentioned. The relationship between metres and kilocycles is: Metres × kilocycles per second = 300,000.

All of which is the final result of a steady attempt during the past few years to encourage the use of this more logical and simple designation.

Mass Messages

IN his article dealing with aircraft radio developments, which appeared in *Flight* of February 2, Mr. H. M. Samuelson remarked that "it would be interesting to know the percentage of air-to-ground or ground-to-air messages dealing with meteo matters."

Although no figures are yet available for the year 1938, those for 1936 and 1937 are sufficiently interesting. These have been extracted from the *Civil Aviation Statistical and Technical Review* of 1937 and even in that year the great increase over the previous year is worth noting.

The figures are:—

	1936.	1937.
Weather reports passed to aircraft	19,835	36,017
D/F bearings passed to aircraft	36,120	36,144
D/F reciprocals passed to aircraft	18,590	30,868
D/F positions passed to aircraft	998	1,567
Aircraft controls and miscellaneous messages sent and received	117,025	266,831

A REFINED KOOLHOVEN: The high-wing monoplane is notoriously bad for purposes of wheel retraction, but Mr. Koolhoven, in an effort to produce a three-seater tourer with good vision and a high performance, has resorted in the FK54, to the arrangement illustrated on left, the wheels of course being tucked into the fuselage. With a Gipsy Major Series II the top speed is 155 m.p.h.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

ROLLING THAT MOTH

The Owner Answers the G.E.s.

"TWO G.E. Pilots," in *Flight*, of February 9, appear to have put forward a very insular defence. *My* confidence in a Moth was, and is, based on the word of the constructors and A.I.D. inspectors, *not* on my own opinion, and so long as an Aerobatic Category is not withdrawn by either of them from year to year on Moths it is proof-positive that that machine is perfectly safe for aerobatics by any pilot, if he feels like it. The hours of a Moth don't matter, because the inspector is not going to sign off any machine under suspicion.

Imagine the confusion and mirth were an inspector to write in a certificate, or in the logbook, "Aerobatic Category granted only for expert pilots"! This would be essential, according to the argument of "Two G.E. Pilots," but I happen to know that they sign a machine for an Aerobatic Category, without asking who is going to fly it, and will *refuse* to sign a machine which they do not find to be of an Aerobatic Category. What *horrible* disasters would occur if inspectors differentiated between learner-pilots and expert pilots!

May an "old gentleman" of 42 suggest that these "Two G.E. Pilots" trust their constructors and inspectors a little more, and their own timid judgment a little less? They might find this method of approach to their work a benefit, not only to themselves, but to others keen enough to want to improve their flying.

F. S. SYMONDSON.

Colyton, Devon.

UNDERCARRIAGE FAILURES

A Specialist Designer's Disclaimer

AS the company with which I am connected are specialists in the design and construction of aircraft landing gear, we feel qualified to offer, for the guidance of the public, a few notes which may help to allay doubts, and possibly fears, which might have been created by the publicity given to recent failures of retractable landing gear on public transport aircraft.

The prime function of the undercarriage is, of course, to absorb the energy of the descending aeroplane when landing and the amount of energy to be absorbed is dependent on the speed at which the aeroplane lands. Contrary to statements expressed in some of the daily papers recently, the fitting of retractable undercarriages in no way increases the landing speed of the aeroplane.

The sole object of retracting the undercarriage is to reduce the resistance of the aeroplane and thus increase its flying speed.

Many of the leading aircraft constructors realised some time ago that the design of aircraft undercarriages and retracting mechanism called for specialists' knowledge and experience.

On all undercarriages manufactured for the Royal Air Force, special safety devices are incorporated so that should there be any failure of the normal mechanism for undercarriage lowering this emergency device can be instantly brought into use, ensuring speedy and safe lowering by auxiliary means.

With a background of many years of experience in the design and construction of this specialised equipment, it is regretted that some aircraft manufacturers take upon themselves the responsibility for the design of their undercarriage mechanism, and in fairness to the firms specialising in the manufacture of aircraft landing gear it should be pointed out that the designs of the landing gears which have recently failed are not those of specialist undercarriage designers.

Cheltenham. G. H. DOWTY, F.R.Ae.S., M.I.Ae.E.
Managing Director, Aircraft Components, Ltd.

[Editorial comment on this letter appears on page 200.]

MULTIPLE CREWS

Experience on a Pan-American Flying Boat

HAVING just received out here *Flight* dated January 12, I have been reading the editorial paragraph on multiple crews in large aircraft, and the following observation on a trip I made last month on the *Philippine Clipper* may be interesting to some of your readers.

I was one of ten passengers on the trip out of Hong Kong, and the crew on this occasion was eight strong, as follows:—

Captain,	Wireless Operator,
Navigator,	Flight Engineer,
First Pilot,	Steward.
Second Pilot,	

Plus one additional captain for, I gathered, experience purposes.

Being somewhat interested in flying I got into conversation with the captain, who was very communicative, and the interesting feature is that the first five-mentioned operatives are actually interchangeable and, in fact, do interchange for the purpose of keeping up their respective licences.

The captain is not necessarily a watch-keeper, but the others are, and the first and second pilots take alternate watches at the controls.

I must add that a trip in these flying boats commends itself for comfort in every way.

J. WINNING.

Shanghai, China.

DIRECT FUEL INJECTION

Results in Sleeve-valve Engines

IN your comments on the reference made to the direct petrol injection by Mr. Fedden in his recent lecture, you state that this system should give a slight increase in power.

As you suggest, it is easy to visualise increased volumetric efficiency due to the cooling action of the spray, but I would point out that, coupled with this, the induction temperature should be considerably higher, due to the fact that the blower is compressing air and not a fuel-air mixture. This would also be responsible for an increase in the power absorbed by the blower (approximately 20 per cent. used to raise the temperature of the air).

These conclusions have given me the impression that the introduction of direct injection would result in a slight decrease in power were it not for the fact that in a highly turbulent cylinder like that of the sleeve-valve type, the process of combustion can be more rigidly controlled by direct injection.

I would be interested to know if these factors were taken into account in your deductions and also the meaning of the statement, "The direct-injection engine will run *satisfactorily* at any altitude."

A. W. H. JAMIESON.

Uxbridge.

[Our comments (in "The Outlook," p. 149, February 16) were based upon recent research carried out for the Committee on Power Plants of the American National Advisory Committee for Aeronautics at the Langley Memorial Aeronautical Laboratory. Details have not yet been issued, but it is known that this research included the testing of an engine with carburetter; with fuel injection into the inlet manifold; and with injection direct into the cylinder. The results seem to have shown that direct injection into the cylinder gave slightly more power on account of the increased volumetric efficiency, and also had the advantage that the manifold could be arranged to offer less restriction to the airflow.

Mr. Jamieson has misread our last sentence. It read "Also the direct-injection engine will run satisfactorily *in any attitude*"; not "at any altitude."—ED.]

NEW PETROL-FROM-COAL PROCESS

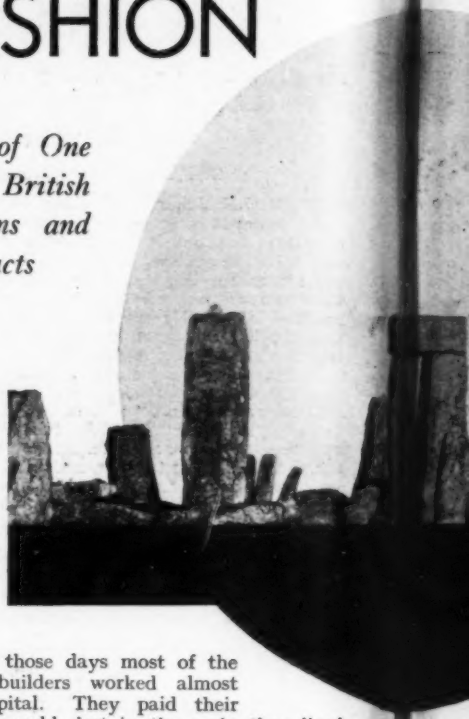
AN experimental plant has been erected at Bedlay, near Glasgow, for the production of synthetic petrol from coal by a new British process discovered by Professor Fischer, a German chemist. The plant is producing 200 gallons per day, and it is claimed that the spirit is of such high quality that it is suitable for aero engine use.

The new process is a catalytic one and involves, in the first place, the production of water gas by passing steam over coke. It is said that the output consists, roughly, of 50 per cent. motor spirit, something to the order of 30 to 40 per cent. fuel oil, and a fraction of lubricating oil.

The experimental plant has been in operation only for a month or two, but is claimed to have proved that a ton of coal will yield 40 gallons of oil.

. . . and BRISTOL FASHION

The History of One of the Oldest British Aircraft Firms and Its Products



An early Bristol monoplane (Prier type) flying over Stonehenge.

THE history of the Bristol Aeroplane Co., Ltd., is, to all intents and purposes, also a history of British aviation, in that there was very little flying in this country prior to the formation of the company; at any rate, the flying which had been done had of necessity been of a somewhat experimental nature. By that it is not intended to convey the idea that when the Bristol company started there was no further need for experimental flying. Far from it. But the firm differed from nearly all its contemporaries in that it was founded deliberately with the object of designing and manufacturing aircraft on a commercial scale, using the expression in its 1910 and not in its 1939 sense.

To be in a position to view the early history of the company in its proper perspective, it is necessary to recall that flying did not really start until about 1906. The Wright brothers had, of course, flown before that time, but it was not until about 1906 that others began seriously to follow their example in France, Germany and Great Britain. Bleriot flew across the Channel in the midsummer of 1909, and that was quite rightly hailed as a great achievement. This country had ceased to be an island.

Filton in 1910

That was the background against which must be seen the beginnings of the Bristol firm. Its history will be traced in the following pages, and in next week's issue we shall deal with the Bristol engine department, which originated as the Cosmos Engineering Co. and became a part of the Bristol organisation in 1920.

It was in February of 1910 that Sir George White, Bart., founded the British and Colonial Aeroplane Co., Ltd. For many years previously Sir George had been a familiar figure in Bristol's commercial life. He was a pioneer of electric traction in this country, and the family was particularly associated with the Bristol tramways. At that time the British Government showed little or no interest in flying, and one may assume that what influenced Sir George White in his decision to start the British and Colonial Aeroplane Co., Ltd., was his realisation of the enormous possibilities of this new medium as applied to fast transport. Sir George did not live to see the fulfilment of his dream. The war came, and all energies were concentrated on the production of military aircraft. But events have since proved his judgment sound, and flying will yet prove itself the peaceful benefactor of mankind of which all the pioneers dreamed.

The British and Colonial Aeroplane Co., Ltd., was founded with a nominal capital of £25,000. That does not sound a very impressive figure nowadays, but it must be remembered that in those days most of the struggling aircraft builders worked almost literally without capital. They paid their workmen when they could, but in the main they lived on their enthusiasm and their faith. By comparison the new Bristol firm was well capitalised, which meant that money was available for proper plant and shops, while a few failures would not break the company. With him on the original board Sir George White had his brothers, Mr. Samuel White and Mr. G. Stanley White. Mr. Henry White-Smith was secretary of the company, and Mr. Sidney E. Smith was manager.

Land was acquired at Filton, just outside Bristol, where a factory was built. It was of modest dimensions, according to modern ideas, but it was large enough for a beginning, and it was well equipped. The offices were contained in what had been a very charming dwelling-house, standing in its garden, and which still is a fitting reminder of the early beginnings of the firm, standing as it does by the side of the very modern offices which the company put up a few years ago. The water tank at the back was put up on its "stilts" not long after the original works were built, and has stood there on top of the hill as a splendid landmark carrying the Bristol name ever since.

It has been mentioned that the firm was founded with the deliberate intention of building aircraft on a commercial scale from the very beginning. It was that policy which led the directors to commence by obtaining a licence

(Below) The Bristol "family" of 1920. From left to right the types are the Tourer, the Scout type F, the Babe, the monoplane, and the "Brisfit." Behind them all is the huge Pullman passenger-carrier.

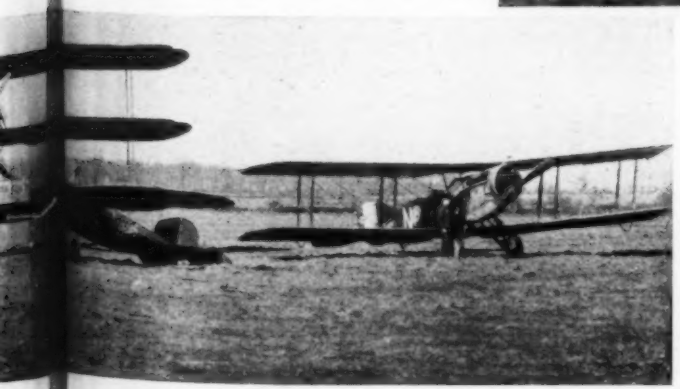
agreement with the French Zodiac company for building machines of that design in this country. At the very outset the firm met with a setback. The machine was not very satisfactory, and was soon dropped. Sir George White was not, however, discouraged. He immediately made the necessary arrangements for establishing a design staff at Filton, and before long biplanes of Bristol design began to make their appearance. Flying schools were established at Lark Hill (Salisbury Plain) and later at Brooklands.

The first aeroplane of Bristol design appeared in June, 1910. It was frankly based upon the Henry Farman of that period, and became known as the Bristol "Box Kite." The biplane wings had single-surface covering. That is to say, each wing rib was housed in a sort of pocket in the fabric, but in between the ribs there was but a single surface. The biplane tail was carried on an outrigger consisting of four tail booms braced by struts and piano wire, and in addition there was a front elevator, which was probably not very efficient as a control surface when the machine was flying slowly, but it *was* useful as a guide to the pilot, in that he could keep it on the horizon and so know whether he was flying level, diving or climbing.

One of the peculiarities of the "Box Kite"—and not merely of the Bristol version, but of all of that general type—was that the pilot had to be fairly smart in getting the nose down if the engine stopped (as it frequently did). The biplane tail was deeply cambered, and therefore carried a good deal of load. Normally, it worked in the slipstream from the pusher airscrew placed but a few feet ahead of it. When the engine stopped the slipstream disappeared, and the tail lost a good deal of its lift.

A simple cradle on top of the lower wing carried the 50 h.p. Gnome rotary engine at the back and the pilot's seat at the front. The petrol and oil tanks (the Gnome used nearly as much oil as petrol) were carried athwart the cradle, just in front of the engine. The pilot sat slightly ahead of the leading edge, with only his feet on the rudder bar to keep him from slipping forward, and nothing to protect him from the draught. And what a draught! Although the machine probably did no more than about 40 m.p.h., the air would blow up one's trouser legs and out at the back of one's neck. Ailerons were fitted to all four wing tips, but they were not interconnected, so that when the machine was standing still they drooped, and as it gathered speed they flapped merrily up and down. There was no engine throttle, and the Gnome either ran full out or stopped. The only control was the switch. By switching on and off, the pilot *could* get a sort of intermittent throttling effect in this way. The engine exhaust came on and died away, came on and died away. It was from this peculiar sound that the switch became known as the "blip-switch."

(Left) Early aviation in India; a Bristol "Box Kite" was demonstrated in 1911 by Henri Jullerot. Below, early streamlining: a "Box Kite" with a cowling over the pilot's legs.



Before leaving the subject of the Bristol "Box Kite" it is of interest to record that in 1910 one of these machines gained second prize at the Lanark meeting. It was for the slowest lap—just over 30 m.p.h.! Early one morning in September of the same year a Bristol "Box Kite" was the first and only machine to fly over the Army manœuvres on Salisbury Plain. It was piloted by Capt. Bertram Dickson, and the flight was witnessed by Sir John French, Lord Kitchener, Lord Roberts and Mr. Winston Churchill. A few days later the first wireless signals were transmitted from a Bristol "Box Kite" to the ground.

After less than a year's existence, the Bristol works at Filton had been found inadequate, and extensions had been built. Nearly thirty machines were constructed at Filton that year; six pilots had been trained on Bristol machines, and many more were receiving instruction.

Towards the end of 1910 the British and Colonial Aeroplane Co., Ltd., sent a mission to India, Australia and

The first Bristol aeroplane—the "Box Kite," with 50 h.p. Gnome rotary engine.

The Bristol-Prier school monoplane. In the pilot's cockpit is Mr. (now Group Capt.) Harry Busteed.

A Bristol biplane designed by Mr. E. C. Gordon England for the Military Trials of 1912 (note the tricycle undercarriage), and the Coanda monoplane.

New Zealand, equipped with Bristol aeroplanes. Early in 1911 the first Government order for aeroplanes was received from Russia, and the British Government placed an order for four machines in March of that year. The capital of the company was increased to £10,000.

During 1911 more than 100 aeroplanes were built and fifty-three pilots got their tickets at Bristol flying schools. The outstanding event of that year was the production of the first Bristol monoplanes. The prototype, which was exhibited at the Olympia Aero Show, had a single-skid two-wheeled undercarriage with a curious "crutch" type of suspension. The engine was a 50 h.p. Gnome. A later version was produced for the Circuit of Britain and became known as the Prier type, after its designer, M. Pierre Prier, a Frenchman who had been an instructor at the Bleriot school at Hendon, but who had joined the Bristol company.

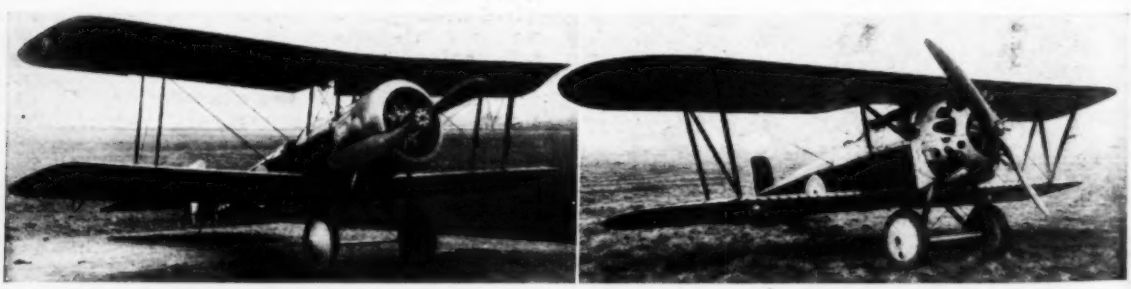
To modern eyes the most unusual feature of the Bristol Prier monoplane was its "floating" elevator and the very tiny rudder (7 sq. ft.). Spinning had not been discovered in those times. It was left to Lieut. Parke, R.N., to do the first spin, in an Avro enclosed biplane during the military trials on Salisbury Plain the following year. Three versions of the Prier came into being, known as the Popular, School Two-seater and Military types respectively. The Popular had a 35 h.p. Anzani engine.

Military Trials

The great aviation event of 1912 was the competition for military aeroplanes, held at Salisbury Plain, for prizes offered by the War Office. Many British and foreign firms entered machines, among them being the British and Colonial Aeroplane Co. In addition to the two military monoplanes designed by Coandă, a Rumanian who had joined the firm, Bristols also entered two biplanes. These had been designed by Mr. E. C. Gordon England, who is now managing director of General Aircraft, Ltd. The competition was won by Col. S. F. Cody, but two third prizes were awarded to the two Bristol-Coandă monoplanes entered. These machines were piloted by Mr. Harry Busteed and Mr. Howard Pixton. Their speeds were 70.5 and 73 m.p.h. respectively. The engines were 75 h.p. Gnome rotaries. The undercarriage was a four-wheeled type, with two small front wheels to prevent nosing over.

Owing to certain wing failures which occurred during 1912, the authorities banned the monoplane type completely. This probably retarded development considerably, and for two or three years afterwards the biplane held undisputed sway in this country. Abroad the Bristol company continued to sell monoplanes, and some were even manufactured abroad under licence.

The year 1912 was a busy one for the Bristol company. In addition to getting the four machines out for the military trials, the firm sent out missions to Spain, Germany and Italy, and received orders from those Governments. Rumania also placed an order, and the Bulgarian army employed a Bristol monoplane for the first time in warfare.



Two versions of the famous Bristol Scout. On the left is the type D with rotary engine and on the right the type F with fourteen-cylinder Cosmos Mercury radial. This machine did 140 m.p.h. and climbed to 10,000ft. in 8 minutes.

A Bristol monoplane with Lucifer engine (right) was a low-power version of the military monoplane.

During the year ninety-eight pilots were trained at the Bristol schools, sixty-three of them at Brooklands. So great had become the demand for Bristol aeroplanes that early the following year the capital of the company was increased to £250,000.

So far as the Bristol company was concerned, 1913 was chiefly a year of school work. A considerable export trade was carried on, but of new types there was only the Coanda military biplane exhibited at the Olympia Aero Show in February of that year. This machine had a 70 h.p. Renault eight-cylinder Vee engine. For a wing span of 38ft. it had a wing area of 440 sq. ft. The weight empty was 946 lb. and the disposable load 880 lb. The speed was about 60 m.p.h. A modified version was shown at the Paris Salon in December of 1913. This had a neat bomb-dropping arrangement, devised by Mr. Coanda, by which a dozen small bombs could be carried in the belly of the fuselage. They could be released by a lever at any desired interval, and sights were provided for the observer.

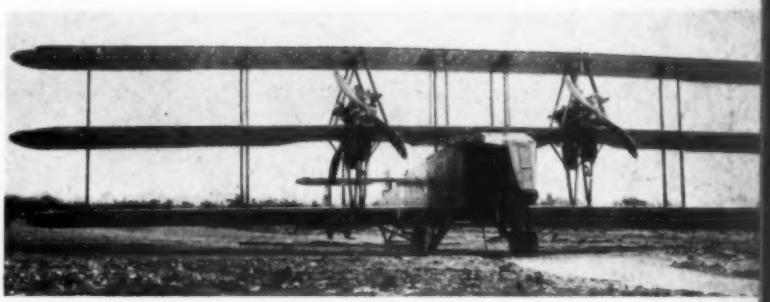
That the Bristol schools were busy in 1913 is shown from the fact that they trained 117 pilots, 70 at the Brooklands school.

The ban on monoplanes caused the British and Colonial Aeroplane Company to concentrate, for a time, on the biplane type. At the Olympia Aero Show, held in March of 1914, the firm exhibited two biplanes. One of these was a two-seater in which Coanda influence could still be traced, notably in the four-wheeled undercarriage. An attempt had, however, been made to reduce air drag by adding to the rectangular main structure of the fuselage cambered fairings on top and bottom. A large spinner over the airscrew hub completed the streamlining.

The M.R.1 was the first all-metal machine produced by the Bristol Company.

The First Bristol Scout

It was, however, in the little single-seater scout, exhibited for the first time, that the greatest promise of speed was evident. This machine had been designed jointly by Mr. (now Group Captain) Harry Busteed and Mr. Frank Barnwell, who had in the meantime joined the Bristol company. The machine was very tiny indeed, with a wing span of only 22ft., an overall length of 19ft. 9in., and a wing area of 156 sq. ft. The engine was Gnome rotary of 80 h.p. The empty weight was 617 lb., and the disposable load 340 lb., giving a loaded weight of 957 lb. Thus, although the machine was destined ultimately to become a military scout type, it would nowadays be regarded as being in the light plane class. The speed was just under 100 m.p.h. with the 80 h.p. Gnome engine.



The "Braemar" was a bomber of 18,000 lb. gross weight. It was fitted with four Siddeley Puma engines.

Actually, the type which went into large production on the outbreak of war was a slightly larger and heavier machine, with a span of 24ft. 7in. and a loaded weight of 1,250 lb. During the war the type became known as the Bullet, and nearly 400 were built, some with Gnome, some with Le Rhône and some with Clerget rotary engines. The machine climbed to 5,000ft. in 6¼ min. and to 10,000ft. in 18½ min. It was one of the first machines to be fitted with a machine gun on a specially designed mounting.

Up to August 4, 1914, the Bristol company had built in all some 260 aeroplanes, and the Bristol flying schools had trained more than 300 pilots.

It has been made clear in the preceding paragraphs that the Bristol company always believed in the monoplane and only dropped building the type because of the Government ban. In 1915 Mr. Barnwell began to occupy himself with the design of an entirely new type, and during that and the following years it was produced in large numbers.

The Bristol monoplane of 1915-16 would not look out of date at the present time, except possibly for its wire-braced wings. In those days cantilever construction was not generally favoured, although monoplanes with this type of wing had been built in France and Germany. The Bristol military machine was a high-wing wire-braced monoplane, fitted with a Le Rhône rotary engine of 110 h.p. The wing span was 30ft. 9in. and the weight empty 850 lb., while the loaded weight was 1,300 lb. With one Vickers gun firing through the airscrew the machine became a very useful fighter, and was

On the left, the Bristol Babe with A.B.C. engine, and below, the Bullet, type 32. This machine was fitted with the first Jupiter engine built by the Bristol company. It was raced in the King's Cup and Aerial Derby.

used extensively, mainly on the eastern front. Its top speed was 130 m.p.h. and it landed at about 50 m.p.h. The climb was regarded as very good, with a height of 5,000ft. in 4 min., 10,000ft. in 9 min., and 15,000ft. in 19 min. About 130 were built during the war.

It was during 1915 that Mr. (now Sir Henry) White-Smith and Mr. H. J. Thomas were made directors of the company.

The aeroplane which really made the Bristol name famous during the war was the two-seater fighter, the official designation of which was the F.2.B., but the affectionate nickname for which, familiar to all war-time pilots, was the "Brisfit." In aerodynamic design the "Brisfit" was mainly remarkable for the fact that the lower wing passed under the fuselage instead of being attached to it. One wonders what led Capt. Barnwell to adopt this arrangement. It seems probable that the jamming of the air in the narrow gap between the bottom of the fuselage and the top of the lower centre-section must have been a source of drag. Be that as it may, the "Brisfit" was an extremely nice aeroplane to fly; it was stable and manœuvrable, and well liked by the pilots. The armament consisted of one fixed gun firing through the propeller, and had a rear gun on a Scarff mounting. The great advantage of the crew's positions was that they were very close together so that communication and team work were facilitated. Altogether something like 3,500 "Brisfits" were built during the war. The Bristol company itself built only a relatively small percentage of these, the rest being built by other firms. After the war the "Brisfit" was in service with the R.A.F. for more than ten years.

With a Rolls-Royce Falcon water-cooled engine of 275 h.p. the "Brisfit" had a speed of 110 m.p.h. and landed at 48 m.p.h. It could climb to 5,000ft. in 7 min., to 10,000ft. in 17 min., and to 15,000ft. in 25 min. The engine was, of course, naturally aspirated. The tare weight of the "Brisfit" was 2,000 lb. and the loaded weight 3,250 lb.

In addition to "Brisfits" the Bristol company built large numbers of scouts and B.E.s during 1916. Altogether more than 700 aeroplanes were built by the company in that year. The founder of the British and Colonial Aeroplane Co., Ltd., Sir George White, died in November, 1916, and was succeeded as chairman by his brother, Mr. (now Sir) G. Stanley White, who is still the firm's managing director.

Up to the end of 1916 all the aeroplanes built by the Bristol company had been of "mixed" construction; that is to say, with wooden structural members and steel fittings. In 1917 the firm produced its first all-metal aeroplane. This was a two-seater reconnaissance biplane known as the M.R.1, or Type 13. Aluminium alloys and high-tensile steel were used in its construction. The fuselage was a tubular girder as regards its main framework, but the covering was aluminium sheet. The wings had a steel framework, fabric covered. A Hispano-Suiza engine of 140 h.p. was fitted, and the armament was one fixed and one rotatable gun. The wing span was 42ft. and the wing area 458 sq. ft. The tare weight was only 1,700 lb., although the loaded weight was 2,870 lb. This gave a ratio of loaded to tare weight of 1.69, a figure which is quite normal to-day, so that the first Bristol all-metal aeroplane appears to have been quite efficient structurally. The speed was about 110 m.p.h. It seems probable that the Bristol M.R.1 was the first British-designed aeroplane to fly in this country.

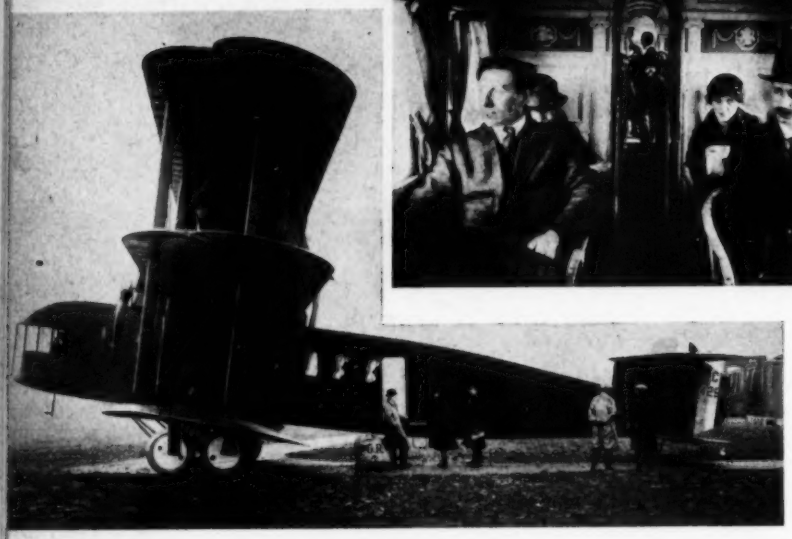
During the year 1917 the Bristol company built more than 1,000 aeroplanes, mostly "Brisfits" and monoplanes.

From a production point of view the year 1918 saw the peak at Filton, as in other aircraft factories. No fewer than 2,000 aeroplanes were built by the Bristol firm during that year, mostly monoplanes and "Brisfits." The problem of long-range bombing was becoming acute, and Capt. Barnwell set to work to design a machine specially for this purpose. In view of the great loads which had to be carried, he chose the triplane wing arrangement in order to get large wing area (actually about 1,900 sq. ft.). The span of the upper and centre wing was 82ft. and that of the lower wing 78ft.

TWO OUTSTANDING BRISTOL TYPES

Above is the aeroplane which made the name "Bristol" famous. The Bristol Fighter, F.2.B., which acquired the affectionate title "Brisfit" during the war. The engine was a Rolls-Royce Falcon of 275 h.p. On the right is the latest Bristol, the Long-nosed Blenheim, with two Mercury VIIIs of 820 h.p. each. This striking aerial impression by *Flight's* chief photographer shows how manœuvrable is the machine.

The Bristol Pullman triplane (left) had accommodation for fourteen passengers in great comfort, as indicated by the inset picture of the cabin.



The Bristol seaplane was a development of the Bristol Fighter. This particular version had a Siddeley Puma.

The Tourer was one of the first commercial aeroplanes used after the war. It was developed from the "Brisfit." The engine was a Siddeley Puma.

The Bristol triplane, which became known as the Braemar, was Type 24. Power was provided by four Siddeley Puma six-cylinder in line water-cooled engines of 250 h.p. each. The tare weight of the machine was 11,000 lb. and the weight fully loaded 18,000 lb. The armament consisted of four Lewis guns and six 250-lb. bombs. Later versions of the Braemar were fitted with four 400 h.p. Liberty engines, but this version was never tried, as they were not ready until shortly after the Armistice.

With the coming of peace the Bristol company's production, like that of all the other aircraft firms, was greatly reduced. That is not to say, however, that it disappeared. Far from it. Even in 1919 almost 1,000 machines were built, mostly "Brisfits," which, as already mentioned, remained standard equipment of the R.A.F. for many years.

The firm immediately turned its attention to civil aircraft, and it was natural that, as the large triplane bomber had just been developed, a commercial version of it should be the first Bristol type to be produced after the war. This machine, the Pullman, was generally similar to the Braemar, but it had a larger and roomier fuselage to give luxurious accommodation for the 14 passengers carried. Every detail calculated to add to the comfort of the passengers had been carefully studied, even to the point of providing an individually controlled electric foot-warmer for each one.

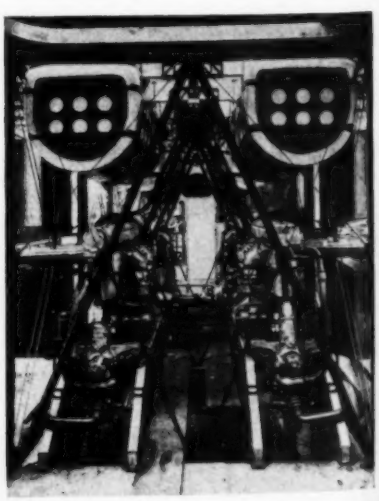
The Bristol Pullman was years ahead of its time, for there were then no air transport companies in existence. But the machine did give an indication of the possibilities which the aeroplane, hitherto an instrument of destruction, had in its application to fast and comfortable travel. By the time air transport ground facilities had been established and operating companies formed, the Pullman was out of date, but it had shown the way in matters of comfort for a considerable number of passengers.

The Lighter Side

At the other end of the scale the Bristol company produced, in 1919, the Babe, or type 30, a tiny single-seater light plane which foreshadowed the coming of private flying in this country, although the actual machine did not go into production. It was regarded by Capt. Barnwell as rather an amusing toy, with its wing span of less than 20ft., and its top plane no more than chin-high to an ordinary man. The first engine fitted was a 40 h.p. Viale, and later a 60 h.p. Le Rhone was installed.

On the last day of 1919 the title of the British and Colonial Aeroplane Co., Ltd., was changed to The Bristol Aeroplane Co., Ltd.

After 1920 came a slump period which hit the whole of the British aircraft industry very hard indeed. Orders were reduced to an absolute minimum, and many a firm was hard put to it to keep alive. The Bristol company employed the lull to good advantage by taking over what had been the Cosmos Engineering Co., itself an offshoot of



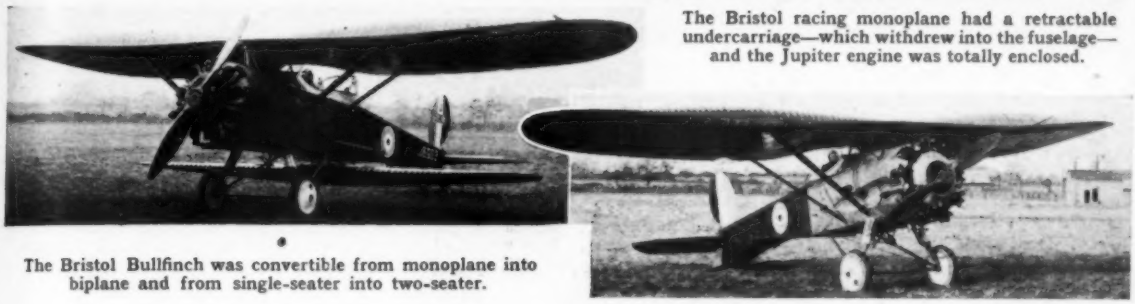
The large triplane shown below was known as the "Tramp." It had four Puma engines in the fuselage, as seen on the right.

Brazil Straker and Co., of Fishponds, Bristol. That firm had started developing radial aero engines some years before, and had, under the technical leadership of Mr. Roy Fedden, made very substantial progress, although handicapped by lack of capital.

The story of the birth and growth of the Bristol aero engine department will be told in next week's issue, but it should be recorded here that 1920 was the year when the control passed over to the Bristol Company. In the light of subsequent history it can now be seen that that was a red-letter day in the history of the firm.

From the years 1921, 22 and 23 there is relatively little to record in the way of new military aircraft types. Orders were extremely scarce and the period was mainly devoted to development work. There was the Bullet, a sporting single-seater with Jupiter engine, which took part in King's Cup and Aerial Derby races. A seaplane was also produced during this period, developed from the "Brisfit."

The Bristol racing monoplane had a retractable undercarriage—which withdrew into the fuselage—and the Jupiter engine was totally enclosed.



The Bristol Bullfinch was convertible from monoplane into biplane and from single-seater into two-seater.

In 1922 the Bristol Tramp was produced. This was a large freight carrier, developed from the Braemar and Pullman, but differing from these two types in that it had a central "engine room," with four Siddeley Pumas, driving outboard airscrews through shafts and clutches. The installation was heavy. That had been expected. But the feasibility of such an arrangement, with its advantage that the engines could be attended to during flight, had been proved.

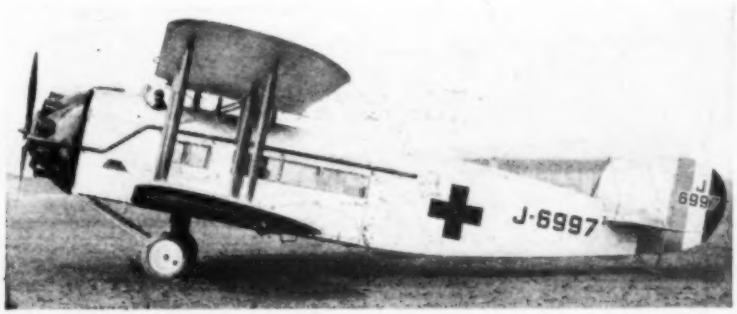
A conversion of the "Brisfit" was produced under the name Tourer, first as a two-seater and later as a three-seater. With a Siddeley Puma engine the Tourer was widely used in the early days of commercial flying, notably by the Instone Air Lines and by West Australian Airways.

A type remarkable for many unorthodox features produced during this period was the type 72 racing monoplane. The fuselage was a wooden monocoque and the wheels retracted into it; the wings, which were very tiny, would not have housed them. The Jupiter engine was accommodated in an enclosed and ducted cowling. The machine was designed to do 220 m.p.h.

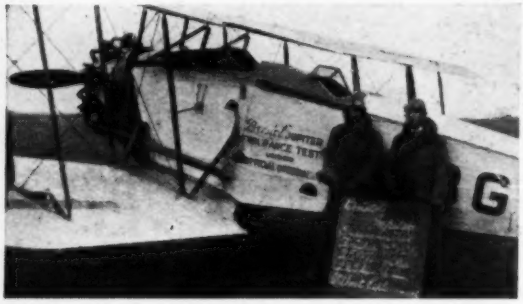
Two post-war Bristol training machines. The Lucifer Trainer of 1923 and the Jupiter-engined Advanced Trainer. The Lucifer Trainer was sold to several countries, and the Advanced Trainer was used at the Bristol School.

Another unusual machine was the Bullfinch, type 52. Economy was the watchword in those lean years, and the Bullfinch was designed to be used either as a single-seater fighter or as a two-seater. As a single-seater it was a parasol monoplane, and as a two-seater it was a sesquiplane, the lower wing and gunner's cockpit part of the fuselage being detachable as units.

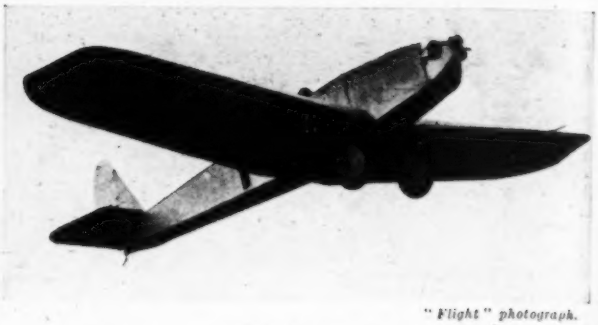
The Bristol Pullman biplane (not to be confused with the earlier and much larger triplane of the same name) was produced in 1924. At first it had a Napier Lion, and afterwards the Bristol Jupiter. From it was developed the Ambulance, which was probably the first British aeroplane specially



The first British Ambulance: The Bristol Brandon. On the left is the swinging engine mounting used in this and other Bristol machines of the same period.

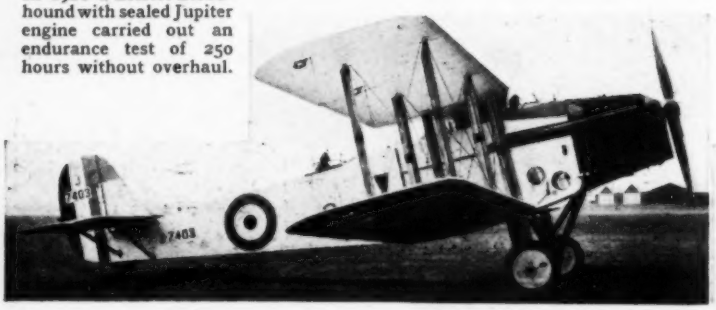


In 1926 a Bristol Bloodhound with sealed Jupiter engine carried out an endurance test of 250 hours without overhaul.



"Flight" photograph.

The Bristol Brownie which took part in the Lympne light plane competitions. It was fitted with a Bristol Cherub flat-twin engine of 34 h.p.



The Bristol Berkeley above was a two-seater bomber with Rolls-Royce Condor engine. On the right the Boarhound with Jupiter engine. It will be observed that the "Brisfit" placing of pilot and gunner close together was retained.

equipped for Red Cross work. A picture appears on the previous page.

The outstanding Bristol design of 1924 was, perhaps, the Bloodhound, type 84. This was a high-performance two-seater biplane with Jupiter engine. In 1926 the machine carried out a 250 hours' endurance test. That is to say, the engine was sealed and was not touched until it had flown 250 hours.

Several new types were designed in 1925, including the Berkeley two-seater bomber, fitted with the Rolls-Royce Condor engine. This was type 90. Then there was the Bristol Boarhound of all-metal construction, later supplied to Mexico, and a laboratory machine used entirely for research work. Both these machines had Jupiter engines.

Two small monoplanes of the Brownie type took part in the light plane competitions at Lympne. They were fitted with the 34 h.p. Bristol Cherub engine.

The Bagshot, built in 1926, was a large twin-engined monoplane of 70ft. span and a weight of 8,000 lb. The wings were remarkable for the fact that they were of multi-spar metal construction.

Other aircraft developed about this time were the Badminton racer with Mercury engine and the 101 with Jupiter. The latter secured second place in the King's Cup race of 1928.

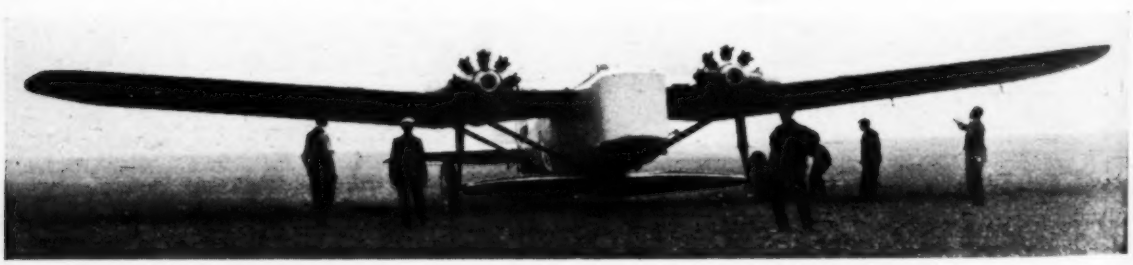
For some years the Bristol Company had been evolving a new structural technique, utilising high-tensile steel. This type of construction was adopted for certain single- and two-seater fighters in 1926-27, and was subsequently applied to the Bulldog single-seater, which was for many years the standard single-seater fighter not only in the Royal Air Force but in the service of several foreign governments.

Characterised by wings of unequal span (the top measuring 34ft. and the bottom 37ft. 6in.), this machine was equipped for day and night fighting. It was of steel-tube construction with fabric covering and, as taken into service by the R.A.F., was fitted with a direct-drive Jupiter engine.

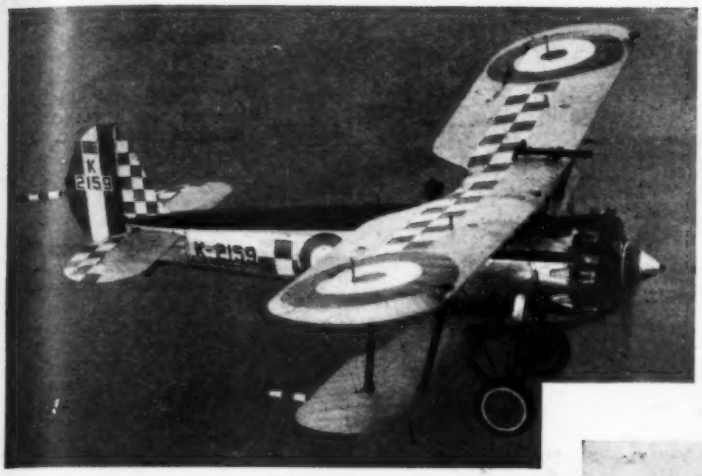
A later development, known as the Bulldog Mark IV, was fitted with a Mercury VI.S, giving a top speed at 16,000ft. of 225 m.p.h.; the climb to 10,000ft. took 4.68 min., and to 20,000ft. 14 min. With full military load the all-up weight was 4,100lb., the empty weight being 2,010lb. Like its predecessor, the Bulldog IV was armed with two synchronised Vickers guns and carried full wireless and night-flying equipment. Racks for light bombs could be quickly attached when required.

Very similar in appearance to the Bulldog, though rather smaller, the Bullpup, or type 107, was produced for an interceptor competition. Originally powered with a Jupiter, this machine subsequently received units of the Mercury and Perseus series. Apart from the twin Vickers guns, there were mountings for one or more pairs of Lewis guns under the bottom wing.

The development of a general-purpose biplane (type 118) in 1930 led to the production, in the following year, of a similar machine known as the type 120. This was a rigidly braced biplane of unequal span; the engine was a Pegasus and the armament installation included the first totally enclosed



The Bristol Bagshot of 1926 had a span of 70ft. The wings were of multi-spar construction and thus provided data for the much later Bombay Bomber-Transport, which is now in quantity production for the Royal Air Force.



A Bulldog IIa single-seater fighter (Bristol Jupiter) with the typical service markings and equipment of its time.

"Flight" photograph.

second installed in a rotatable and retractable power-driven gun turret on top of the fuselage. The standard type as at present in service in the R.A.F. has a top speed at 15,000ft. of 285 m.p.h., and will climb to 20,000ft. in 17½ min. The service ceiling is given as 27,280ft. and the range, at a normal speed of 200 m.p.h., as 1,125 miles. Empty and gross weights are 7,409 lb. and 12,030 lb. respectively. The engines are two Bristol Mercury VIIIs of 840 h.p. (max.) each.

In 1936 history was made when the Bristol 138A high-altitude monoplane fitted with a special Bristol Pegasus engine secured the world's height record for Great Britain, reaching 49,967ft., this being the first instance of such an achievement with an aircraft and en-

"Flight" photograph.

Fitted with four guns and powered with a Mercury engine the Bristol 131 single-seater fighter was one of the most formidable machines of its day.

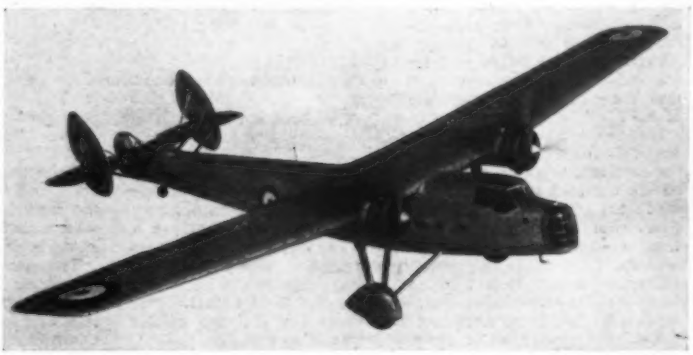
"Flight" photograph.

The Bristol 120 general purpose biplane featured a "parrot cage" and provision for a stretcher case.

gun turret of Bristol design. In the same year Bulldog production reached its peak.

All this time the Bristol Company was striving to perfect a system of all-metal stressed-skin construction, and by 1934 had built a single-seater low-wing cantilever monoplane fighter. Powered with a Mercury engine, the Bristol 133 (as this model was designated) had flaps and a retractable undercarriage and showed splendid performance qualities. The prototype, unfortunately, was crashed.

At the other end of the scale another all-metal stressed-skin cantilever monoplane was produced, though the machine in question was of high-wing design and of comparatively large proportions and was fitted with a fixed, faired undercarriage. This was the Bristol 130 bomber transport, which, under the type name Bombay, is now in quantity production to the Royal Air Force. The two Bristol Pegasus engines used confer a very high performance for a machine in this category.



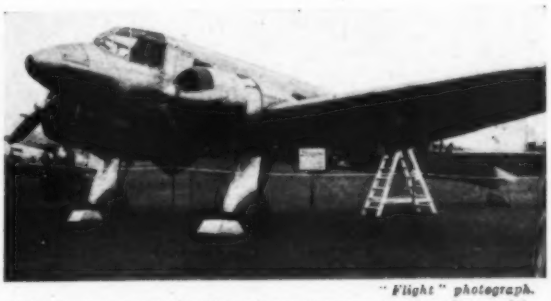
"Flight" photograph.

Now in production for the Royal Air Force, the Bristol Bombay bomber-transport is powered with two Pegasus engines.

In 1934 another modern monoplane—a low-wing type—of all-metal stressed-skin construction was being built for the civil market. Lord Rothermere, seeking a high-speed machine for his personal use, was responsible for the conversion of this type—the 143—into a smaller machine fitted with two Mercury engines in place of the civil-rated Aquila sleeve-valve units originally specified. The modified machine became familiar and famous as *Britain First*. Its performance during Martlesham trials in 1935 was so outstanding that the Air Ministry approached Lord Rothermere for permission to make further tests, with the result that he presented the machine to the nation, and it became the forerunner of the Bristol Blenheim bomber of to-day.

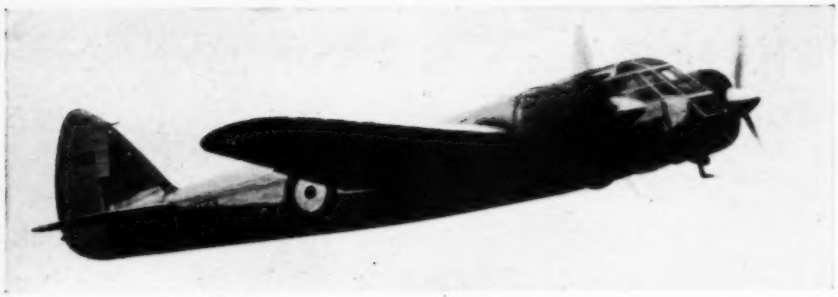
The Blenheim (type 142M), unlike *Britain First*, was produced as a mid-wing type, permitting the internal stowage of the bomb load. It was the first modern all-metal cantilever monoplane of stressed-skin construction to go into production on the expansion of the R.A.F. in 1936.

The Blenheim is intended primarily not only for bombing but for fighting. It carries a crew of three and is normally armed with two machine guns, one fixed in the wing and the



"Flight" photograph.

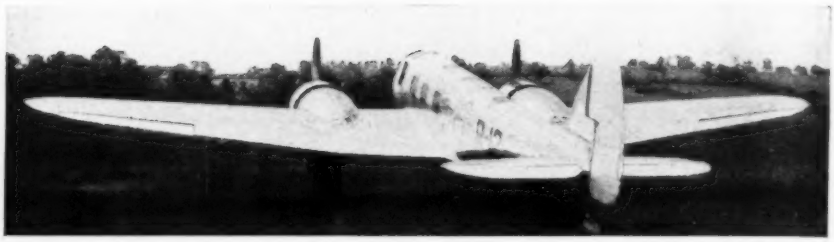
The prototype of the Bristol 143 transport monoplane with two civil-rated Aquila sleeve-valve engines.



"Flight" photograph.

The first Bristol Blenheim bomber which set a new standard for performance in its category.

The Bristol 132 *Britain First* from which the Blenheim bomber was developed.

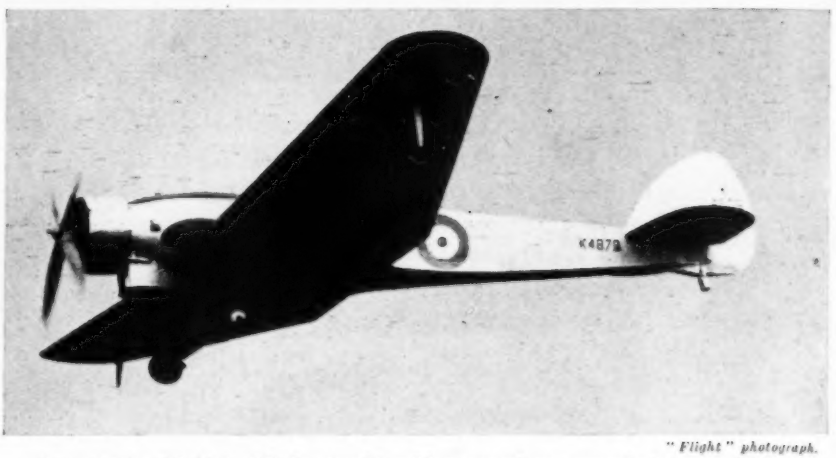


gine of the same manufacture.

The 138A was a low-wing cantilever monoplane of all-wooden construction, even the stressed skin being of very thin plywood. It was a single-seater of exceptionally large dimensions, having a span of 66ft. and an overall length of 44ft. At an all-up weight of 5,340 lb. the wing loading was only 8.6 lb./sq. ft. This machine again beat its previous record and gained the world's altitude record in 1937, reaching a height of 53,937ft.

Among more recent types the only one which may be mentioned at present is the "long-nosed" version of the Blenheim, which represents a very considerable advance even over the standard "short-nosed" type, which is still the fastest machine in its class employed by any air force.

The "long-nosed" Blenheim has improved facilities for bomb aiming and navigation, a nominal top speed of 295 m.p.h. and a range of nearly 2,000 miles. In the main this improvement is due to the employment of 100-octane fuel for take-off. The new version is now going into service with the R.A.F.



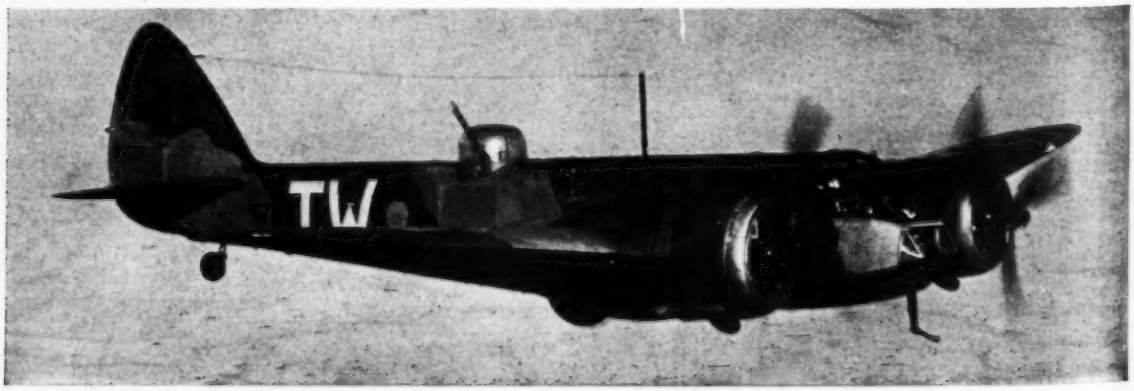
"Flight" photograph.

The Bristol 138A high altitude record-breaking monoplane powered with a special Bristol Pegasus engine.

Meanwhile standard "short-nosed" Blenheims are giving an excellent account of themselves in the Service. Hundreds are in use and some exceptionally fast flights, both by single machines and formations, have been recorded. One machine flew from Abbotsinch to Upavon in 70 minutes against a head wind and with poor visibility. The distance is 335 miles and the time, including a climb to 15,000ft., was 70 minutes, giving an average speed of 280 m.p.h. Blenheims have also been making remarkably good times in the Middle East. One squadron flew from Dhibban to Aboukir, a distance of 811 miles, in 3¼ hours, at an average speed of 250 m.p.h.

Since the death last year of Capt. F. S. Barnwell in an accident to a light aeroplane of his own design, the majority of the responsibilities for aircraft design has fallen on Mr. Frise, who, although he has never figured so prominently in the limelight, is widely known as originator of the Frise aileron.

The precise nature of the aircraft now being planned and developed by Mr. L. G. Frise and his colleagues will not be generally known for some months—probably years—but there is every indication that they will exhibit the same excellent qualities as their forbears.



A typical R.A.F. Blenheim showing the retractable turret in the extended position.

THE ROYAL AERO CLUB

News and Official Notices for the Week Ended February 25

Big Future for Flying Clubs

STEPS have been taken by the General Council of Associated Light Aeroplane Clubs to take the fullest possible advantage of the present wave of popularity in light aeroplane flying. Closer co-operation with the Royal Aero Club has been arranged for the future, and plans are well advanced for a record summer programme of instructional work.

In February, 190 Aviators' Certificates were granted, and a curious sidelight on the detailed figures which were presented to The Committee of the Royal Aero Club last week is that seaside clubs have generally been at the head of these activities. The Southend, Bournemouth, Cinque Ports, Hampshire and Portsmouth clubs are high in the list.

Since October more than 100 certificates have been granted each month, and in February the record set up in December was nearly equalled.

Gliding Subsidy Decision

THE possibility of earning an increased subsidy is now presented to the Gliding Club movement in this country. The Air Ministry decision made known to the British Gliding Association was to the effect that the gliding clubs will be allowed to train Air Defence Cadets up to a maximum of 700 per year. The plan visualises fourteen-day gliding camps at which the training will be done. The Air Ministry proposes to continue to leave the administration of the subsidy entirely in the hands of the British Gliding Association and the Gliding Subsidy Trustees.

The Air Ministry proposals were considered and accepted in principle by the Council of the British Gliding Association at a meetng held at the Royal Aero Club on Friday, February 24.

Record Passed

THE provisional figures given in the Royal Aero Club official notices of February 17 for Mr. Alex. Henshaw's return flight between Gravesend and Cape Town were confirmed and passed by The Committee of the Royal Aero Club and they have been forwarded to the F.A.I. with the official claim for capital-to-capital records in Category I (for solo pilots). The average speeds out and back were given at 244.876 km./hr. (152.1 m.p.h.) and 243.745 km./hr. (151.4 m.p.h.). A difference of only 11 minutes separated the outward time from that of the homeward journey.

Model Contest

FOR the first time the competition between model aeroplanes for the King Peter II Cup will be held in Great Britain this year. This is the second contest of the series and Britain were the winners last year. The aerodrome is to be Heath Row, near the Great West Road, and the date is July 17-23. The King Peter Cup is a handsome silver trophy awarded for competition between national teams by the young King of Yugoslavia, who is intensely keen on model flying.

Olympic Gliding

ALL competitiors in the new gliding contests, which, in 1940, are, for the first time, to form a part of the Olympic Games, will fly in the same type of machine. Steps are being taken this week to decide what this machine shall be. Comparative tests are to be made in Italy of four different gliders by six expert glider pilots of six different nationalities. Two of the machines are German, one Italian, and one Polish.

The actual Olympic Gliding trials will take place on the aerodrome at Jämijärvi, in Finland, from July 22 to August 1, 1940. Crews must present themselves at Helsinki on July 20 for the opening of the Games.

Air News

FRANCE.—Airmen are particularly requested not to fly over the following areas and national parks:—

(1) La Basse-Camargue (Bouches-du-Rhône).
(2) The Lauzanier Valley (Hte. Vallée de l'Ubayette, Basses-Alpes).
(3) The Neouvieille massif (Vieille-Aure, Hautes-Pyrénées).
(4) The Sept-Iles archipelego (off Perros-Guirec, Cotes du Nord).

Aviators' Certificates

No.	Name.	Club or School.	Date.
17,095	Robert Arthur Haylock ...	West Suffolk Aero Club ...	15.2.39
17,096	Albert James Brodie McIntyre	North of Ireland Aero Club	15.2.39
17,097	Arthur Leslie Greenacre ...	Grimsby Aero Club... ...	17.2.39
17,098	Harold Norton Passmore Rowe	Bournemouth Flying Club...	17.2.39
17,099	Bernard William Jeffries ...	Bournemouth Flying Club...	17.2.39
17,100	Hugh Bernard Allan	Bournemouth Flying Club...	17.2.39
17,101	Villiers Peveril David	Airwork Flying Club ...	8.2.39
17,102	Bernard John Collins	Hampshire Aeroplane Club	17.2.39
17,103	Richard Dring	Norfolk and Norwich Aero Club.	17.2.39
17,104	Albert Douglas King	Southend Flying Club ...	17.2.39
17,105	Frederick Arthur Webster ...	Southend Flying Club ...	16.2.39
17,106	Charles George Alfred Colloff...	Southend Flying Club ...	16.2.39
17,107	William Octavius Cooksey ...	South Coast Flying Club ...	12.2.39
17,108	Harry Archibald Stringer ...	South Coast Flying Club ...	14.2.39
17,109	Alfred John Martin	County Flying Club ...	6.2.39
17,110	Harry Frederick Mayes ...	County Flying Club ...	16.2.39
17,111	John Laurence Deloford ...	Malling Aero Club	16.2.39
17,112	William Reginald Pease ...	Doncaster Aero Club ...	16.2.39
17,113	Reginald Frank Stubbs ...	Lancashire Aero Club ...	15.2.39
17,114	Edward Kenrick	Tollerton Aero Club ...	15.2.39
17,115	Frank Selby Wilson	Tollerton Aero Club ...	14.2.39
17,116	Walter Scott Ogilvie	Doncaster Aero Club ...	24.1.39
17,117	Hugh Iden Wetherell	Cinque Ports Flying Club...	14.2.39
17,118	Harold William Brice	Cinque Ports Flying Club...	14.2.39
17,119	James Nicholas Gordon Bateman.	Norfolk and Norwich Aero Club.	18.2.39
17,120	Edward Paul Rudolph William Cornish.	Herts and Essex Aero Club	18.2.39
17,121	John Harrison	Herts and Essex Aero Club	18.2.39
17,122	Stephen Hubert Murray ...	Herts and Essex Aero Club	18.2.39
17,123	Robert Henwood Walling ...	Herts and Essex Aero Club	16.2.39
17,124	Stanley Pigott	Grimsby Aero Club... ...	18.2.39
17,125	Aubrey William James Ayles...	Bournemouth Flying Club...	17.2.39
17,126	John Keith Milner	Yorkshire Aeroplane Club ...	18.2.39
17,127	Charlton Orme Bastian ...	Yorkshire Aeroplane Club ...	18.2.39
17,128	Herbert Mark Benton	Norfolk and Norwich Aero Club.	19.2.39
17,129	Robert Crichton Mitchell Cotts	Worcestershire Flying Club	19.2.39
17,130	Patricia Annette Blackwell ...	Insurance Flying Club ...	13.2.39
17,131	George Humphrey Huang ...	Far East Flying Training School, Hong Kong.	18.7.37
17,132	Edward Walford Miller ...	London Aeroplane Club ...	11.2.39
17,133	Harold Wallace Petty	County Flying Club ...	15.2.39
17,134	Frederick Harold Vernon ...	County Flying Club ...	17.2.39
17,135	Ernest William Hall	County Flying Club ...	18.2.39
17,136	Dennis Arthur William Batchelor ...	Romford Flying Club ...	14.2.39
17,137	Leslie Thomas Radford ...	County Flying Club ...	19.2.39
17,138	Robert Martin Ross	Hull Aero Club	19.2.39
17,139	Gabriel Augustine McCormick...	Hull Aero Club	19.2.39
17,140	Helen Drew	Border Flying Club... ...	18.2.39
17,141	Joseph Jack Feesey	Southend Flying Club ...	20.2.39
17,142	David Malcolm Anderson ...	Scottish Flying Club ...	18.2.39
17,143	Benjamin Kennedy Nelson ...	Scottish Flying Club ...	19.2.39
17,144	Robert James Curtis	Redhill Flying Club ...	11.2.39
17,145	Philip Sobey	Hampshire Aeroplane Club	18.2.39
17,146	George Prospero Wills	Hampshire Aeroplane Club	18.2.39
17,147	George Arthur Farley	No. 9 Elementary & Reserve Flying Training School, Ansty Coventry.	20.2.39
17,148	Bridget Grace Marian Ledger Hill.	Wiltshire Flying Club ...	17.2.39
17,149	Edward Shard Prebble... ...	Malling Aero Club	21.2.39
17,150	Paul Leof Phillips	Malling Aero Club	21.2.39
17,151	Sydney Stokoe	Newcastle-on-Tyne Club'	19.2.39
17,152	John Haker	Herts and Essex Aero Club	19.2.39
17,153	Lionel Harry Such	Herts and Essex Aero Club	20.2.39
17,154	Kenneth Richard Colwell ...	Cotswold Aero Club ...	19.2.39
17,155	Leslie George Cochrane ...	Portsmouth Aero Club ...	17.2.39
17,156	Kenneth Herbert Summers ...	Portsmouth Aero Club ...	16.2.39
17,157	Leslie Ernest Gisburne... ...	Portsmouth Aero Club ...	12.2.39
17,158	Irene Joan Malthoff	Southend Flying Club ...	21.2.39
17,159	Edward Albert Jay	Southend Flying Club ...	20.2.39
17,160	Joseph John Henderson ...	Southend Flying Club ...	21.2.39
17,161	Dudley Osborne...	Northern Aviation Club ...	11.2.39
17,162	Rowland Bridge	Northern Aviation Club ...	10.2.39
17,163	Malcolm Hudson	York and Leeming Flying Club.	19.2.39
17,164	Ernest George Birks	Cinque Ports Flying Club...	14.2.39
17,165	Charles Blacklock Robinson ...	Border Flying Club... ...	21.2.39
17,166	John Bernard Walker	Herts and Essex Aero Club	20.2.39
17,167	William Oliver Cramer... ...	Herts and Essex Aero Club	22.2.39
17,168	Peter Landers	Doncaster Aero Club ...	21.2.39
17,169	Stanley Clifford Thornley ...	Cardiff Aeroplane Club ...	21.2.39
17,170	Norman Kenneth Redway ...	Liverpool and District Club	17.2.39
17,171	Harry Owen Houchen	Airwork Flying Club ...	18.2.39
17,172	Derek Stewart Ruttledge ...	Airwork Flying Club ...	21.2.39
17,173	William George Devas ...	No. 23 E. and R.F.T.S. Rochester.	25.1.39
17,174	Frank Edward Main ...	Portsmouth Aero Club ...	20.2.39
17,175	William Henry Barfield ...	Ipswich Aero Club	21.2.39
17,176	Frank Albert Mason	Plymouth and Dist. Club	22.2.39
17,177	Robert Kay Morris	London Aeroplane Club ...	12.2.39
17,178	Harry Arthur Murrell Woolhatch.	London Aeroplane Club ...	21.2.39

SERVICE AVIATION

"Flight" photograph.

SEEING FOR HIMSELF: Mr. W. J. Sanderson, president of Fleet Aircraft of Canada, Ltd., Fort Eerie, Ontario, is an accomplished pilot, and he recently visited the Handley Page aerodrome at Radlett and flew a Hampden. His company, which is one of the manufacturing units of Canadian Associated Aircraft, Ltd., is to build Hampdens.

Royal Air Force and Official Announcements : Fleet Air Arm News : Military Aviation Abroad

Auxiliary Group Renamed

NO. 6 (Auxiliary) Group, which has its headquarters at Tavistock Place, London, W.C., has been renamed No. 6 (Bomber) Group. This group was placed within the Bomber Command when the new organisation of the home units came into force in July, 1936, but, as has recently been announced, the auxiliary air squadrons of which it had control have now been reconstituted as fighter instead of bomber squadrons, and transferred to Nos. 11 and 12 (Fighter) Groups.

Cadetships for Aircraft Apprentices

FOUR apprentices, J. H. Deas and R. H. Clifford from No. 1 School of Technical Training (Apprentices), Halton, and B. Clegg and J. A. Plumb from the Electrical and Wireless School, Cranwell, have been selected for cadetships at the Royal Air Force College, Cranwell, on the result of the examinations held on completion of their three years' training.

"Viscount Wakefield" scholarships, at the Royal Air Force College, of the value of £75 each, have been awarded to Flt. Cadet R. H. Clifford, and to Flt. Cadet A. E. Whitworth, an open competition entrant.

The "Hyde-Thomson Memorial Prize," of the value of approximately £29, has been awarded to Flight Cadet B. Clegg.

Reunion Dinners

IT is proposed to hold a reunion dinner of past and present officers of No. 62 Squadron, R.F.C and R.A.F., in London at the end of March or beginning of April this year. All past officers are invited to communicate with the Adjutant, No. 62 (B.) Squadron, R.A.F., Cranfield, Bletchley, Bucks, giving, at the same time, the names and addresses of any other past officers known to them.

The fifteenth annual reunion dinner of the R.A.F. Staff College Dinner Club will be held at Grosvenor House, London, on Friday, March 24, at 7.30 p.m. for 8 p.m., with Air Chief Marshal Sir Edgar Ludlow-Hewitt in the chair. Evening dress (no miniatures) will be worn. Cheques (16s., including cocktails, sherry, port and incidental expenses) should be sent to the hon. secretary, R.A.F. Staff College Dinner Club, Andover, Hants; they should be made payable to the hon. secretary and crossed "Dinner Club A/c."

Royal Air Force Garden Party

THE second Royal Air Force Garden Party will be held on Saturday, June 24, at Trent Park (Cockfosters), which has again been lent by Sir Philip Sassoon, M.P., First Commissioner of Works and a former Under-Secretary of State for Air.

As a result of the first Garden Party, held at Trent Park on July 2 last, the Committee has made a donation of £50 to the Royal Air Force Benevolent Fund, £25 to the Air League of the British Empire and £10 to the Dominion Students' Hospitality Scheme.

The garden party will once more provide an opportunity, particularly in the case of those home from overseas, for a general meeting of officers and their families, as was afforded formerly by the Royal Air Force Display.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—

P/O. Ingram Edward Pease (flying solo) lost his life in an accident which occurred near Kinross, on February 18, to an aircraft of No. 603 (Fighter) Squadron, Turnhouse, Edinburgh.

A.P/O. Herbert William Stanton Stanton-Hope (flying solo) lost his life in an accident which occurred at Hullavington on February 21 to an aircraft of No. 9 Flying Training School, Hullavington, Chippenham, Wiltshire.

Royal Air Force Gazette

Royal Air Force

General Duties Branch

The following Flight Lieutenants are granted permanent commissions in that rank (January 6):—G. W. Golledge, W. M. Graham.

The following (from Reserve) are granted short-service commissions as Pilot Officers on probation (February 6):—P. J. C. Harper, W. Surtees.

Acting Pilot Officer on probation C. J. E. Chamberlain is confirmed in his appointment and graded as Pilot Officer (January 14).

The following Pilot Officers on probation are confirmed in their appointments (January 25):—H. R. P. S. Bilbrough, D. G. O'Brien, F. G. Quick, I. Stapleton.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—J. W. Hathorn (Acting Flight Lieutenant) (December 3, 1938); W. I. Hammond (January 8); R. E. S. Skelton (Honorary Flight Lieutenant) (Capt. Royal Tank Corps), A. C. G. Wimbush (Lieutenant, Royal Tank Corps) (seniority January 20, 1938); A. J. Mason (Acting Flight Lieutenant), G. E. Wallace (Acting Flight Lieutenant), T. M. Buchanan, D. W. Balden (January 27).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—R. J. P. Prichard (seniority January 25, 1938) (April 25, 1938); A. K. Hunter (seniority March 23, 1938) (April 25, 1938); R. D. Baughan (January 10); G. E. Watkin (January 15); G. R. Brady (January 18); D. C. Pritchard, M. L. fl. Beytagh, T. G. Kirby-Green, D. W. Lindsay (January 29); J. A. Pitcairn Hill, H. F. Cox, P. S. Butler, E. H. Lynch-Blosse, J. E. Grindon (January 31); B. T. Scott (February 3); H. J. Lyon (February 8); R. B. Barker (February 10); P. E. B. Martin, A. J. Madge (Acting Flying Officer) (February 13); F. W. S. Keighley (February 16); H. R. MacD. Beall (February 17).

Lt. L. C. B. Ashburner, R.N., is reattached to the Royal Air

SERVICE AVIATION (CONTINUED)

Force as a Flight Lieutenant with effect from February 11 and with seniority of July 1, 1936; Lt. F. E. C. Judd, R.N., Flight Lieutenant, R.A.F., ceases to be attached to the Royal Air Force on return to Naval duty (February 13); Lt. G. T. S. Gray, R.N., Flying Officer, R.A.F., ceases to be attached to the Royal Air Force on return to Naval duty (February 13); Flt. Lt. J. W. Hathorn is transferred to the Reserve, Class C (February 6); Wing Cdr. E. T. Carpenter, A.F.C., is placed on the retired list at his own request (February 1).

The following resign their short-service commissions on the dates stated: Flying Officers:—J. E. Thornton (February 15); H. C. Maudslay (February 16). Pilot Officers:—N. C. Tatam (January 31); A. G. Evans (February 11).

F/O. M. Grissell (Lieutenant, 10th Hussars) relinquishes his temporary commission on return to Army duty (November 23, 1938).

Equipment Branch

The following Flying Officers (Acting Flight Lieutenants) are promoted to the rank of Flight Lieutenant (January 8):—J. H. Barnes, C. F. Harrington.

Flt. Lt. F. J. B. Powell, M.B.E., (R.A.F. Ret.), is granted the honorary rank of Squadron Leader (September 5, 1938). (Substitution for notification in *Gazette* of February 7.)

The following Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer (January 10):—C. J. G. Ferguson, K. H. Gooding, M. G. Lees, G. E. Robinson, G. W. Topliss.

F/O. (A. Flt. Lt.) D. Stephenson resigns his permanent commission (February 15).

Medical Branch

Flt. Lt. V. D'A. Blackburn, M.B., Ch.B., is transferred to the Reserve, Class D (February 2).

Dental Branch

F/O. J. F. O'Brien, L.D.S., is promoted to the rank of Flight Lieutenant (January 3).

Chaplains Branch

The Rev. S. W. Harrison is granted a short-service commission with the relative rank of Squadron Leader (February 13).

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following are granted commissions in Class CC as Flight Lieutenants on the dates stated:—Capt. D. E. Dempster (late I.A.), Capt. F. L. Woledge (late I.A.) (October 5, 1938); Lt. E. L. Leader (October 10, 1938); Flt. Lt. S. A. Turner, M.B.E. (R.A.F., ret.) (October 25, 1938); Maj. H. P. Johnston (T.A.R.O.) (November 14, 1938); Capt. R. Wilson (Sp.U.L., I.A.) (January 2).

F/O. M. M. Kaye is transferred from Class C to Class A (December 3, 1938).

The following Pilot Officers relinquish their commissions on appointment to the Air Branch of the Royal Navy on the dates stated:—J. J. Hoath, G. M. M. C. Wheeler (January 16); T. J. A. King-Joyce, R. M. S. Brewer (January 23).

F/O. R. Beresford relinquishes his commission on account of ill-health and is permitted to retain his rank (February 22).

The following Pilot Officers relinquish their commissions on appointment to short service commissions in the Royal Air Force (February 6):—P. J. C. Harper, W. Surtees.

The notification in the *Gazette* of September 6, 1938, concerning F/O. T. O'N. East is cancelled.

Royal Air Force Volunteer Reserve

General Duties Branch

Lt. Col. H. G. Gauntlett (I.A. Ret.) is appointed Hon. Flight Lieutenant with effect from September 12, 1938, and Hon. Wing Commander with effect from December 12, 1938; R. C. E. Law is granted a commission as Pilot Officer (February 21).

The following Acting Pilot Officers on probation are confirmed in their appointments on the dates stated:—M. J. Aldrick, S. J. Berry, T. E. Burgess, H. C. Chatterley, R. W. S. Cross, E. R. Desborough, L. H. Edwards, P. S. Edwards, F. M. H. Harper, W. K. Harris, W. D. Hart, F. B. S. Horsey, H. J. A. Kinsman, D. R. Parkinson, D. Tollerton, N. A. Little (October 10, 1938); F. Attree, R. L. Culley, N. J. Howes, W. J. Attwood, S. R. Baden, C. R. Clark, R. Fenwick, J. M. Kenchington, A. Levers, R. A. Little, H. J. Lucie-Smith, H. W. Newstead, W. R. Norton, D. W. Roberts, E. C. Shaw, A. Southgate, G. H. Turpin, W. Wigmore, R. Williamson (October 19, 1938); B. J. Bushe-Caryesford, D. A. Crane, P. D. V. Hackett, S. P. Quick, A. G. R. Revell, P. G. A. Boustead, J. E. G. Burnett, A. B. Holloway, G. W. B. Plaistowe, J. H. L. Pugh, J. B. Taylor (October 26, 1938); F. H. Davies, C. A. Smith, H. E. Warner-Horne, H. C. Appleton, S. Barr, B. H. Cunningham, C. F. Guest, F. W. Hunt, T. B. King, B. S. Ottley, D. J. Rouse, H. W. G. Triggs, R. A. Turner, G. E. Lloyd, D. F. Poole, E. G. Outram-White, A. D. Rose (November 3, 1938); F. J. S. Britnell, D.F.C., A. E. L. Cooper, C. H. Gresswell, N. S. Hodgson, C. R. Mitchell, G. S. A. Ollis, A. C. R. Pearce, R. V. Scrivener, E. S. Wastie, L. N. White (November 10, 1938); R. L. Winterburn, H. W. Furness, A. G. Ettridge, D. L. Kings, T. D. McA. Boyland, S. A. Byrd, A. H. Edwards, C. D. Garton, P. A. M. Goudge, A. F. S. Gough, A. R. Grutchfield, R. W. Compton-Hall, R. H. Johnson, F. W. Smith, L. W. Stotter, J. R. Turnbull, R. R. Wisher (November 17, 1938); E. W. Veysey, R. W. Gray, D. A. Varley, N. A. Colledge, A. J. Fairclough, J. Farr, S. J. Frost, T. A. Lee, J. T. Nicholas, A. L. Redgrove, A. Reid, J. H. Rendell, A. J. Sanford, H. E. W. Stocken, P. H. Thomson, H. C. Windsor (November 24, 1938); R. T. Cackett, G. J. Bulman, S. G. Vickers (November 30, 1938).

F/O. J. P. H. Balston relinquishes his commission on appointment to a commission in the Auxiliary Air Force (February 21).

Administrative and Special Duties Branch

The following are granted commissions as Pilot Officers on probation (February 14):—W. R. Adkins, J. C. S. Ahern, W. F. Anning, H. Arnold, A. G. Baker, E. B. Baring, L. E. Barry, Sir A. L. Bcit, Bart., M.P., B. M. Bell, S. H. Bell, A. G. Berry, S. H. Bingham, S. H. Bird, T. E. H. Birley, W. T. Blake, B. L. Blomley, R. S. L. Boote, A. V. Burbury, M.C., P. T. Carden, F. G. Carpenter, H. D. Clevely, J. E. B. D. Cochrane, L. Cohen, D.S.O., M.C., R. M. Colebrook, R. Cook, J. A. Cooper, G. H. Courtenay-Luck, F. T. Cox, W. N. Cronshaw, Sir A. R. W. Curtis, K.C.V.O., C.M.G., M.C., W. E. Cutlan, E. A. Dennis, K. T. Dowding, D.F.C., E. D. Drew, J. M. Drysdale, J. D. E. Dudley, V. F. S. Dunton, C. F. Edwards, F. C. Edwards, J. F. Ellor, R. Fenner, J. C. Ferguson, A. M. Fitzrandolph, L. V. Foster, D. W. T. Fox, F. W. I. V. Fraser, O.B.E., M.C., G. Frecheville, C. R. R. Gidney, C. G. Gilbert, T. E. T. K. Green, R. Harcourt, W. S. Harms, J. S. Heagerty, G. Henderson, E. H. Henton, M.M., G. C. Heseltine, R. F. Hewitt, J. L. Hillary, J. F. Houchin, W. Hurst-Barnes, F. S. Isaac, D. L. Jacques, F. L. James, E. D. Jennings, J. Johnson, D. Jones, L. A. Kann, G. D. Lane, F. H. R. Law, W. Law, F. W. Lee, S. Leigh, F. A. Lewis, A. F. Livingstone, M.B.E., H. W. F. Long, W. H. R. Lukey, S. F. Lydon, R. B. Martyn, M.C., C. M. Maud, D.F.C., R. W. Mitchell, H. M. Morris, D.S.C., K. D. P. Murray, M.C., R. W. Napier, D. H. Oakley, E. R. Ortner, R. F. Palmer, J. W. Patterson, F. R. Pender, E. B. Pinder-Davis, E. R. H. Pollak, M.C., N. H. Richardson, H. Rothery, A. W. Rouse, E. O. Rutherford, J. F. R. B. de Sarigny, O.B.E., J. E. L. Skelton, A. T. Smith, J. S. Smith, R. J. F Sulivan, D. O. Thomas, F. E. Tighe, H. T. R. Twyford, F. H. P. Warmington, C. D. G. Welch, N. H. Witter, A. J. Woodhouse.

Medical Branch

The following are granted commissions in the ranks stated (February 21):—Sqn. Ldr. J. F. Simpson, M.R.C.S., L.R.C.P., F.R.C.S.; Flt. Lts. J. S. Harper, M.B., Ch.B., M.R.C.P.; I. S. McGregor, M.B., Ch.B., D.O.M.S.; W. C. Munro, M.R.C.S., L.R.C.P.; J. Wingate, M.B., Ch.B.; F/O. M. P. Morel, M.B., Ch.B., M.R.C.S., L.R.C.P.

Auxiliary Air Force

General Duties Branch

Col. O. D. Smallwood, C.B.E., T.D., D.L. (T.A.), is granted a commission as Wing Commander, with effect from January 20, to command No. 5 Balloon Centre on formation; Col. W. C. C. Gell, D.S.O., M.C., T.D., D.L. (T.A.) is granted a commission as Wing Commander, with effect from January 18, to command No. 6 Balloon Centre on formation; Lt. Col. and Bt. Col. G. R. Curtis, O.B.E., T.D., is granted a commission as Wing Commander, with effect from January 19, to command No. 12 Balloon Centre on formation.

No. 500 (COUNTY OF KENT) (GENERAL RECONNAISSANCE) SQUADRON.—J. P. H. Balston is granted a commission as Flying Officer (February 21).

No. 609 (WEST RIDING) (FIGHTER) SQUADRON.—P/O. L. H. Sagar is promoted to the rank of Flying Officer (January 26).

No. 610 (COUNTY OF CHESTER) (FIGHTER) SQUADRON.—P/O. A. D Graham is transferred to the Reserve, Class C (September 24, 1938).

No. 612 (COUNTY OF ABERDEEN) (GENERAL RECONNAISSANCE) SQUADRON.—P/O. A. M. Scott is promoted to the rank of Flying Officer (January 30).

No. 904 (COUNTY OF SURREY) (BALLOON) SQUADRON.—C. T. Fitzgerald is granted a commission as Flying Officer (January 19).

No. 905 (COUNTY OF SURREY) (BALLOON) SQUADRON.—A.P/O. E. G. Bunce-Phillips is promoted to the rank of Flying Officer (September 2, 1938).

No. 906 (COUNTY OF MIDDLESEX) (BALLOON) SQUADRON.—R. H. Lubbock, M.C., is granted a commission as Flying Officer (January 5).

No. 922 (WEST LANCASHIRE) (BALLOON) SQUADRON.—Maj. R. A. T. Cave-Mathieson (T.A.R.O.) is granted a commission as Squadron Leader and appointed to the command of the squadron (January 25); F. C. Stubbs is granted a commission as Pilot Officer (January 25).

No. 928 (COUNTY OF GLOUCESTER) (BALLOON) SQUADRON.—J. P. Hitchings is granted a commission as Squadron Leader and appointed to the command of the squadron (February 6).

No. 929 (COUNTY OF GLOUCESTER) (BALLOON) SQUADRON.—R. A. Hall is granted a commission as Squadron Leader and appointed to the command of the squadron (February 6).

No. 942 (EAST RIDING) (BALLOON) SQUADRON.—G. E. S. Lamb is granted a commission as Squadron Leader and appointed to the command of the squadron (January 25).

SERVICE AVIATION (CONTINUED)

FOREIGN SERVICE NEWS

A Question of Calibre

AN Italian writer has made a comparison between the effectiveness of the 13.7 mm. and 20 mm. automatic guns firing explosive bullets at a muzzle velocity of 800 metres/sec. Assuming a weight of 120 kg. for armament he visualises either two of the lighter guns with 720 rounds of ammunition or one of the heavier weapons with 160 rounds.

Assuming also that the rate of fire of both types is 720 rounds a minute the two lighter guns would be able to fire ten bursts of three seconds each, whereas a 20 mm. gun could fire only four. Despite the fact that the weight of the projectiles per burst favours the heavier weapon (8.6 kg. against 5.8 kg.) it is believed that the greater number of bursts more than compensates for this. Moreover, in the interests of reliability the rate of fire of the 20 mm. gun would probably have to be less than 720 rounds per minute, as assumed, in which case the rate of fire might even favour the lighter guns.

The writer states that air fighting in Spain has demonstrated that only close-range engagements (of the order of 220 yards) are effective, which means that the larger number of bullets available when using guns of 12.7 mm. bore would be decisive. In fact, for general use, the 7.5 mm. gun with its extremely high rate of fire would suffice.

"Faucheur" Developments

FOKKER has issued new figures for the G.1 (or *Faucheur*) twin-engined fighter-bomber. This machine, it may be recalled, has a tail carried on two booms and is available as a two- or three-seater.

The armament in the pilot's cockpit comprises two fixed machine guns of 7.9 mm. calibre, with 550 rounds for each gun, or two shell-guns of 20 or 23 mm. bore with boxes for 95 rounds for each gun.

Following English practice eight rifle-calibre machine guns may be installed, with 500 rounds for each, though the guns are fitted in the nose and not in the wings.

The occupant of the rear conical-shaped revolving turret has only one gun (7.9 mm.) with 600 rounds. In view of the excellent field of fire attainable, due to the peculiar lay-out of the machine, this fact is somewhat surprising but is probably explained by the very limited space available in the turret.

When used as a bomber, the G.1 will accommodate projectiles up to a weight of 880 lb.

Performance figures with fully supercharged Bristol Perseus X sleeve-valve engine are: Top speed, 300 m.p.h.; climb to 19,685ft., 10.7 min. (with fighter or attack load); service ceiling 30,150ft., and range at cruising speed, 944 miles.

Shell-Gun Data

A CERTAIN amount of data on Continental aircraft shell-guns is available and the following notes, from a French source, outline the position to-day.

It is believed that the calibre of an aircraft shell-gun should be not less than 20 mm., the shell containing 20 kg. of high explosive. Difficulties of installation impose an upper limit (for the time being, at any rate), of 37 mm. (50 gm. of explosive).

The shell must be fitted with contact fuses of extreme sensitivity. Given the same muzzle velocity the rate of fire of the 20 mm. and 50 mm. are 500 and 200 rounds a minute and the weights are 50 and 300 kg. respectively.

The recoil force of a 50 mm. gun is about 1,000 kg., whereas that of the 20 mm. weapon is only 200 kg. To offset this the larger gun has twice the effective range of the smaller (2,000 m. against 1,000 m.).

Generally speaking, modern aircraft shell-guns have a locked breach and recoil as a complete unit. It is generally possible to fire only in a longitudinal axis though there was, of course, the Westland low-wing interceptor which had a 37 mm. gun mounted on the side of the fuselage and firing upwards.

Twin-engined fighters mounting from two to four shell-guns are now in being.

Although the principal advantage of the shell-gun is its long range as compared with the rifle-calibre machine gun, it must be remembered that long-range fire requires very accurate sights, the development of which is, perhaps, hardly keeping pace with progress in the design of guns. For close-range work the fighter with multi machine guns (à la Spitfire and Hurricane) will undoubtedly give the best results.

Algerian Workshops

THE first aircraft works in North Africa are in course of erection at the Maison Blanche aerodrome, near Algiers. They will be used for the repair of military machines, and later for the construction of new military aircraft. Over 500 workers are already said to be employed in the construction and equipment of the shops.

Turbo Blowers for the Boeing

IT is announced that a development of the Boeing B-17 four-engined bomber (a standard type in the U.S. Army Air Corps) has its Wright Cyclone engine fitted with exhaust driven superchargers and intercoolers. The YB-17A, as the new version is designated, is basically similar to its forerunner, weighing about 22 tons and having the following dimensions: Span, 105ft.; length, 70ft.; overall height, 15ft. The armament comprises five machine guns and the crew is from seven to nine men. The standard B-17 has a top speed of over 250 m.p.h. and a maximum range, at economical cruising speed, of over 3,000 miles.

Parachute Troops

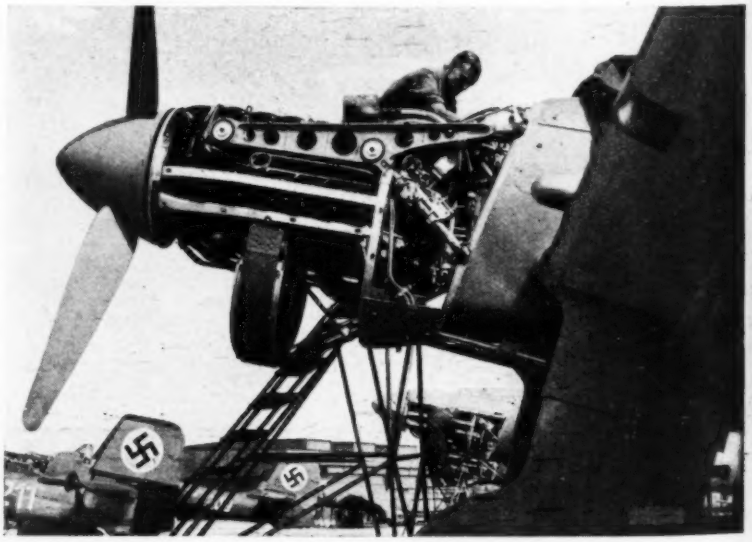
SOME fairly detailed information on the training and utilisation of parachutists in warfare has lately become available. France's Central Training School for Parachutists is at Pujant-Avignon, where well over 2,000 jumps have been made from machines without any serious consequences.

The two types of parachute employed are the Irvin S.G.P. and the Russian Irving. Landing speeds, it is reported, vary between 16 and 23 ft./sec.

The troops dropped by parachute are armed with a light machine gun and a 7.5 mm. rifle, contained in special leather cases strapped to the parachutist. On nearing the ground the man can release the bundle, which falls about 20ft., then being suspended by a rope. The effect of the bundle touching the ground first is to slow up the descent.

Heavier types of guns are dropped in containers attached to special parachutes. The container weighs about 110lb. and can accommodate a weight of 330lb. in the form of ammunition or special guns up to 37 mm. calibre. Even mortars of 81 mm. calibre have been successfully dropped.

The functions of parachute troops would be: Temporary occupation of a sector; flank protection; pursuit; destruction of roads, etc.; and parachutes may also be employed for the dropping of Intelligence agents.



DIVE BOMBERS OF THE LUFTWAFFE: Junkers Ju. 87 two-seater dive bombers (Jumo 211 engine) of the German Air Force. These machines have a special flap for reducing the diving speed and permitting a close approach to the target. Bomb displacement gear—for guiding the bomb clear of the airscrew—is visible behind the radiator housing.

The Interceptor Again

A CORRESPONDENT in China is of opinion that the Japanese bombers will shortly receive the biggest surprise of the war, the Chinese Government having ordered a number of American Curtiss-Wright interceptor monoplane fighters.

The machine concerned is known as the CW-21 and has the following characteristics: Initial rate of climb, 5,000ft./min.; climb to 10,000ft., 2.8 min.; climb to 20,000ft., less than 6 min.; service ceiling, 35,000ft.; top speed, over 300 m.p.h.; normal gross weight, 4,092 lb. The armament comprises one Colt-Browning 0.30in. gun with 500 rounds of ammunition and one Colt-Browning 0.5in. gun with 200 rounds.

The pilot's seat is armoured to deflect bullets coming from behind and below.

The engine is a nine-cylinder Wright Cyclone with a two-speed supercharger and drives a constant-speed Hamilton airscrew.

Use is made of the new Curtiss-Wright "tell-tale" instrument panel which is designed immediately to attract the pilot's attention to improper operating conditions and to indicate the specific item or items at fault.

Netherlands News

AS already recorded in *Flight*, the Fokker company has sold the licence for the G-1 twin-engined twin-hulled monoplane to the Danish Government. Sixty-five machines of this type are also being built by Fokker for the Dutch Army. These will have Bristol Mercury engines of 840 h.p. (max.) each and will be fitted with eight Browning machine guns mounted in the nose.

In addition, Fokker is building a twin-engined bomber, designated the T-9, for the Netherlands Indies. This will be an all-metal type fitted with two Bristol Hercules engines. The prototype is being financed by the Dutch Government and will be tested in Holland this summer.

Other items of news from Holland are that the Kromhout engine works at Amsterdam is building the 160-h.p. Armstrong-Siddeley Genet Major under licence for the Dutch Army and Navy; that the Dutch Government has recently acquired three Focke-Wulf Weihe twin-engined advanced trainers for the Dutch Army; and that the final number of Koolhoven F.K. 58 single-seater fighters ordered by France is 50.

BOMBER FROM BELFAST: A fine photographic impression of the prototype Hereford bomber (two Napier Dagger engines) which is now in production at the Short and Harland works at Belfast. On the left is Mr. H. L. Piper, who has done most of the test flying on this interesting cousin of the Hampden.

Production in a Mountain

SOME months ago a group of Swiss business men and military authorities started a campaign in the Press with a view to creating a Swiss aircraft industry. Although Switzerland possesses an excellent militia, her air force, writes a correspondent, has been rather neglected until recently.

A "preliminary" company with a capital of about £25,000 has been formed to pave the way for the new factory. The latest news is that the preliminary work has been successfully accomplished and a manufacturing company called the Pilatus Swiss Aeroplane Works, Ltd., will be founded within a few days with a capital of £250,000.

Since the beginning of this year energetic prospecting operations have been in progress at the Burgenstock, a mountain near Lucerne, the top of which is 3,700ft. above the level of the lake. The factory will be located inside the mountain together with shell- and bomb-proof hangars.

At the outset the company will manufacture a foreign aircraft type under licence, the engine for which is already being built in Switzerland.

There should be no difficulty in securing a supply of 20 mm. shell guns from the Swiss Oerlikon factory.

BRISTOLIAN in DERBY

Mr. A. H. R. Fedden Lectures on Sleeve-valves to a Rolls-Royce Audience

THERE were at least two points upon which most people agreed when Mr. A. H. R. Fedden repeated, before the Derby Branch of the Institution of Automobile Engineers, his R.Ae.S. lecture* on Bristol sleeve-valve engines. The first was that there was room for both sleeve- and poppet-valve engines. The second was that whether one used as a basis of comparison for two engines, h.p. per sq. in. of piston area or output per litre, the only true basis was the performance, side by side, of two units of similar power, and thus depended upon drag and weight.

It was to be expected that Mr. Fedden, carrying the Bristol gospel into the home camp of Rolls-Royce, would meet a barrage of difficult questions and he is to be congratulated upon the simple and honest way in which he answered most of them, and the neat way in which he side-stepped a few.

The lecture was followed, as in London, by the showing of the cinema film of sleeve-valve operation, and the discussion was then opened by Mr. Elliot. His main points were that the sleeve-valve, while very suitable for air-cooled radial engines, would not be so efficient in the case of in-line liquid-cooled units. The chief of several reasons was the increase in length which was necessitated. For a poppet-valve engine of Rolls-Royce type, the inter-cylinder distance could be as low as 0.65in., while for a sleeve-valve engine the minimum was 1.75in., making a difference of over 6in. in the length of the engine. Again, the relative weights of cylinder assembly for poppet and sleeve designs were 2.68 lb. and 7.2 lb. respectively.

There followed a series of questions posed by members of the Rolls-Royce technical staff, among whom were Messrs. Ellor, Pearson, Cantrell, Lovesy and Dory. Some thirty questions were answered by Mr. Fedden as follows:—

There was room for both types of valve gear, and he recalled the Barr and Stroud motor cycle engine. The difficulty in that case was the materials, but these were now good.

Pilots had told him that machines with sleeve-valve engines were quieter than with poppet-valve engines. Both the *Scylla* type and a twin-engined military machine had been found to be quieter with sleeve-valve engines.

Referring to length, he realised that in the case of in-line engines, weight and crankshaft harmonics entered into the question. Identical liquid- and air-cooled sleeve-valve units were to be run side by side.

Breathing was better with bores of 5in.; Rolls-Royce would be able to tell him of experience with 6in. bores. Poppet-valve ports on engines of the 500 c.c. motor cycle type were perhaps better from the point of view of breathing than were sleeve ports.

Results of Failures

The theory that wreckage in the case of a sleeve-valve engine would be greater had been shown in practice to be wrong. Sleeve drive failures were localised; damage from piston failures was about the same as with a poppet-valve engine. It was admitted that the Bristol Company were worried at first, and it was realised that sleeves must be dead reliable. It had taken much time to achieve this.

With regard to the question of what advantage a user obtained from the sleeve-valve engine, Mr. Fedden said that in the case of Bristol radial engines the output was better than with the push-rod type of comparable size; there were no oil leaks or valve maintenance; fewer spares were required; the engines were cleaner; they cost less, and they could be produced more quickly.

Major troubles centred on (a) pistons, (b) the ball-sleeve drive, and (c) how to make sleeves.

The advantage of sleeves over push-rods, and the troubles experienced with valve bounce, etc., in large radial engines probably did not affect in-line engines with overhead camshafts to the same extent.

With regard to limitations of output, the figure of 6.2 b.h.p./sq. in. of piston area was not the maximum which could be obtained. Mr. Fedden had great regard for the high-output-short-life policy seen in Rolls-Royce racing engines. In general, Bristol policy was reliability at any cost. (The figure of 9 b.h.p./sq. in. of piston area was mentioned in connection with Rolls-Royce engines.)

It was hard to make a neat double-row four-valve radial engine, and he did not know how to deal with the breathing.

Installation drag and weight was a true basis of comparison, as already mentioned. Bristol thought they had "a bit up their sleeve" in this connection. In any case, the engine was neat, clean, and good from the production point of view.

Answering a question in connection with cylinder arrangement, Mr. Fedden had in mind two-, three-, and four-row radials, and thought sleeves would be an advantage for all of these. The "X" type engine could be considered as a six-deep radial with four cylinders per bank.

DTD 49 D low-carbon steel was found at the present time to be suitable for sleeves.

Fins had been left off the bottom of the cylinder barrels simply to give access to the holding-down nuts.

The accumulation of carbon in the ports was not serious in an engine which had done 440 hours in the air (this was the maximum period so far). Thanks to the excellent work of the metallurgists, the expansion properties of the materials were not at all bad.

In answer to a question on the various designs of sleeve drive used during the development period, Mr. Fedden said that the integral ball which he illustrated was difficult to assemble and expensive to produce.

With regard to the oil film in large-bore cylinders, no troubles had been experienced with the film in 5¾in. × 7¼in. cylinders (the largest so far). Due to the moving oil films on each side of the sleeve, it was almost "transparent" to heat.

The power drop on a sleeve-valve engine after about 100 hours' test was in the region of 1 per cent.

Answering the Throttle

In answer to a question on acceleration in service, two Empire boats had so far put in about 40 hours' flying with sleeve-valve engines, and it could be said that, at any rate, they were as good in this connection as the poppet-valve units.

Answering a question concerning the smoothness of power acceleration and the low-speed effect of sleeve valves on ignition units: The sparking plug position in the sleeve-valve heads was not quite so good as on the poppet-valve engines. The valve gear was, however, quite quiet when idling, and good reports had been received from squadrons of Vildebeeste IVs. A special sparking plug had been developed to suit the engine.

Fuel of a little over 100-octane value was used for high-power tests on a single-cylinder unit. The oil feed and cooling were normal.

Concerning a question as to the various designs of induction manifold during development, the control of swirl had been found to be very important, the difficulty being too much swirl.

Out-of-balance forces on present engines had not presented any difficulties.

Tests in Canada had shown that sleeve valves did not present any extra cold-starting problems, and the torque on cold days was much the same for sleeve or poppet-valve engines.

The oil cooler on the Northrop monoplane used as a flying test bed for the Hercules was not disproportionate considering the output of the engine. The heat losses of an engine were roughly 2.5 per cent. oil, 45 per cent. exhaust, and 15 per cent. cooling air.

The exhaust gases were definitely cooler on a sleeve-valve engine in view of the increased compression ratio used with a fuel of given octane value. Exhaust manifolds in service had a life of some 150 to 200 hours. Troubles might be experienced later when higher power outputs were obtained.

The mechanical efficiency of Perseus and Mercury engines at 1,800 r.p.m. was, near enough, the same.

Sleeves had not behaved any better towards detonation than poppet-valve engines, but tests on very weak mixture had been quite satisfactory.

Other points mentioned were the fact that the oil circulation on sleeve-valve engines was increased by about 20 per cent. as compared with poppet-valve engines, but some 70 h.p. more were taken from 25 litres capacity. Oil circulation in American engines was a great deal up.

The Bristol Taurus engine had as small a diameter as possible considering the cooling necessary for an engine of so high an output. Considerable difficulty was being experienced with the Continental small-diameter double-row poppet-valve engines. Some form of cooling similar to that on the De Havilland Gipsy XII might be applied for the rear banks of multi-row small-diameter radials.

* Reported in some detail in *Flight* of February 16.

MORE About the B.I.F.

Aircraft Plastics in the London Section

WHILE it would be an exaggeration to claim that there are a great many exhibits of aeronautical interest at the London sections of the British Industries Fair, it would be equally untrue to say that there is none at all. These sections are mainly devoted to exhibits outside the sphere of engineering, so the show at Olympia and Earls Court is not comparable with that at Castle Bromwich (some notes on which appeared in last week's issue of *Flight*).

The *Air Ministry* has a civil and R.A.F. information bureau at Earls Court, though it seems doubtful if it has been exactly besieged by enquiries from visitors who have come to see the fashions, fabrics and furnishings which form the bulk of the exhibits there. However, it finds a place in the British Empire section, as does the combined stand of *Imperial Airways* and *British Airways*.

At Olympia the plastics industry is strongly represented, which is only natural in view of the almost limitless applications which its products now find in almost every branch of industry.

F. A. Hughes and Co., Ltd. (a name which one automatically associates with Elektron alloy and finds less easy to associate with plastics, though they are equally famous in that field) display a blade by Airscrews, Ltd., in laminated wood bonded with their "Rockite" resin; an attractive new decorative panelling in "Jicwood" ply surfaced with glossy cellulose acetate sheet—this should have possibilities for aircraft interiors; some large wedge-shaped laminated wood members for the Airspeed Oxford, the wedge shape being ingeniously roughed-out from a parallel length by inserting non-adhesive paper, step-fashion, between the laminations before pressing; and "Mipolan," a new synthetic, oil proof, ozone-proof and non-inflammable cable covering. An interesting development in plastic materials was also hinted at.

At Castle Bromwich: The stand of Herbert Terry and Sons, Ltd. The "Anglepoise" lamp forming the central feature is somewhat larger than that used to illuminate the navigator's table in the Short Sunderland!

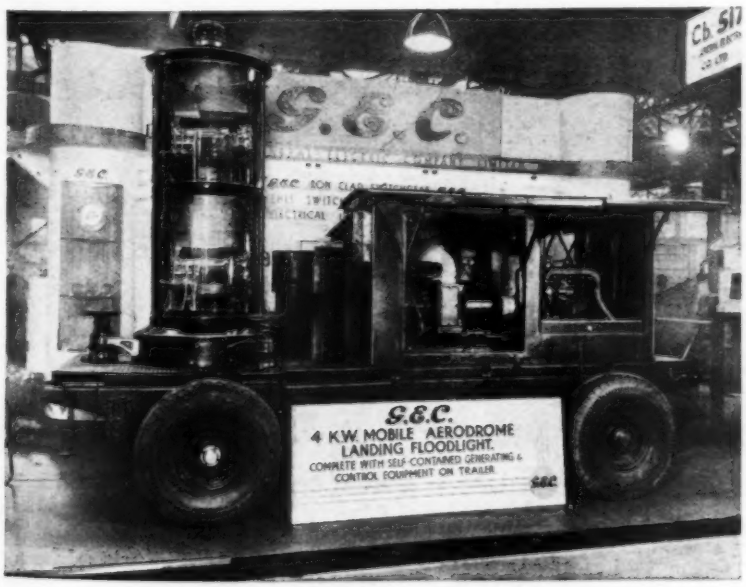
Imperial Chemical Industries are not featuring "Perspex" in their B.I.F. exhibit, but nobody needs reminding of the popularity of this transparent sheeting for aircraft glazing

Bakelite, Ltd., is another firm which, so far as the London B.I.F. is concerned, is being modest about its aeronautical achievements, but everybody knows of its successful experiments with both laminated and hollow-moulded components and of aircraft parts in "Plybond." "Texolex," produced by the Bushing Co., Ltd., is made from fabric treated with Bakelite resinoid and is used for shims, rings and so forth in v.p. airscrews, undercarriage gear and other components.

Very considerable attention has been given to plastic possibilities in aircraft by *Ebonestos Industries, Ltd.*, and they now claim to be able to produce laminated mouldings in almost unlimited continuous lengths. By way of illustration they are showing a length of some 30 or 40ft.—in helix form for the sake of exhibition convenience—and a girder member with riveted cross-bracing. By this "Amigo" system, as it is known, continuous lengths can be made with varying cross-sections. When tested by hand, the material (which is an impregnated fabric and not moulded from a powder) seems to have the resilient quality of steel.

On the stand of *Insulators, Ltd.*, who mould phenol, urea and other materials to A.I.D. specification, we learned something of the intricacies of successful moulding, and inspected some of the massive, mirror-finished moulds which produce the results. We were told, for instance, how an accurately finished mould, a good material and the right pressure will result in a job without "flashes" (a term that will be familiar to casters of metal), and how important is the right period of "cooking" of each material before it is withdrawn from the mould.

British Celanese, Ltd., display, at first sight, an attractive series of lamp-shades and other domestic articles, but a closer inspection of the stand brings to light an airscrew blade covered with "Celastoid"



The outstanding exhibit in the G.E.C. display at Castle Bromwich is a 4kW mobile floodlight, with petrol engine, alternator, exciter and switchgear mounted on the trailer.

by the Schwarz process and a number of examples of "Novellon" transparent sheeting and its application to such aircraft at the Blenheim, Battle and Skua. One very nicely shaped moulding in this material, strong yet light, forms the aerodynamic covering for a wing-tip navigation light.

An air defence exhibit, consisting of a model of a 3.7in. gun and an actual Vickers predictor, is surmounted by a 90 cm. searchlight by *Chance Bros. and Co., Ltd.* The light, unceasingly casting its beam round Olympia's lofty roof, is unfortunately (and perhaps purposely) mounted too high to give one more than a remote worm's-eye view.

These exhibits are in the scientific instruments section, and here we find such familiar names as *Barr and Stroud, Ltd.* (featuring their famous binoculars) and *Cooke, Troughton and Simms, Ltd.* A member of the latter organisation, obviously a little weary of members of the public prodding the Vickers projection microscope and remarking "what a lovely magic lantern," demonstrated for our benefit that very remarkable apparatus. Its outstanding feature is great robustness—it can carry metallurgical specimens of up to 50 lb. weight—which means that you neither have to mount it on springs or rubber nor wait till the works have closed down for the night before beginning your photo-micrographic researches.

Equally fascinating to see in action is the Vickers contour projector. Enlarged 10, 25 or 50 times, the thread contour of, say, a tap, is projected in shadow form on a translucent screen bearing an accurate drawing of what that particular thread *ought* to look like; and sometimes the disagreement can only be described as "something 'orrible." Needless to say, the degree of horror can be accurately measured.

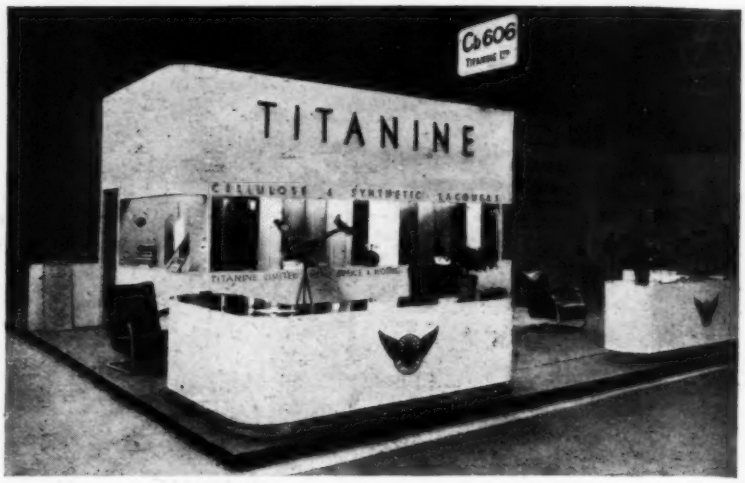
A search amid a vast display of domestic and other glassware on the stand of *James A. Jobling and Co., Ltd.* brought to light an aerodrome obstruction light glass; and this firm should know something about glasses and lenses for all manner of lights and heats, since they are manufacturers of "Pyrex"; likewise, they know something about aviation, for Mr. Jobling-Purser is a keen pilot and King's Cup Race competitor.

On the upper floors at Olympia are three other interesting exhibits. *Plantation Wood, Ltd.*, demonstrate the uncanny lightness of their Lata balsa wood. The balsa trees in their Ecuador plantations grow from a seedling to 80 feet, with 30in. diameter trunk, in five years! Hence the weight of 6 to 9 lb./cu. ft.

International Model Aircraft have some perfect little 1/72nd scale models of almost every famous aircraft type; scores of other models, including the ever-popular Frog types; and a beautifully made Empire flying boat, with every internal detail to scale, moulded in plastic material—selling at £5 5s. finished or 25s. as a kit; this model has been purchased to the number of 1,200 by Imperial Airways for display purposes.

Model Aircraft Stores (Bournemouth), Ltd., appear to be showing everything that the model aircraft enthusiast can wish for, including a new 6 c.c. petrol engine that really looks designed for the job, as opposed to the familiar type that merely suggests a scaled-down two-stroke motor cycle engine.

The Fair, both in London and Birmingham, closes to-morrow.



Attractive finishes attractively exhibited: the Titanine stand at the Birmingham section of the B.I.F.

A SUPER LOCKHEED

The new (and, until very recently, secret) Lockheed single-seater twin-engined monoplane fighter, which as already recorded in *Flight*, met with an accident when landing at Mitchell Field after a very fast cross-country flight. The general layout is similar to that of the Fokker G-1. A tricycle undercarriage is used and the engines are liquid-cooled Allisons of 1,000 h.p. each giving a reported top speed of nearly 400 m.p.h. These are fitted with exhaust-driven superchargers and would appear to have a very low cooling drag. The pilot has wheel control, which indicates that the machine will not be used for advanced aerobatics. This is not the first twin-engined single-seater fighter on record, the Boulton and Paul concern having produced a machine with two Lynx engines many years ago. A noteworthy characteristic of the Lockheed is its thin wing section. The nature of the high-lift devices installed has not yet been revealed; possibly some sort of Fowler flap is employed.

AIRWORTHINESS and the A.R.B.

The G.A.P.A.N. Discusses an Interesting and Important Subject

IF those who attended the discussion, held recently at the Royal Aero Club on the subject of Airworthiness and the Air Registration Board, expected to be told exactly where we stand under the new regime, they were mildly disappointed. The details divulged were few, but the impression was formed that the A.R.B. intends to adopt a friendly and by no means dictatorial attitude. And that is something to the good.

The discussion had been arranged by the Guild of Air Pilots and Navigators, whose Deputy-Master, Capt. Rex Stocken, was in the chair. Dr. H. Roxbee Cox, Ph.D., D.I.C., B.Sc., F.R.Ae.S., chief technical officer of the Air Registration Board, opened the discussion. He recalled briefly the history and development of airworthiness regulations.

Before the war airworthiness did not exist as a distinct branch of aeronautics. In 1910 flying was prohibited within five miles of Charing Cross, but no steps were taken to ensure safety in flight. During the war the seeds of airworthiness were sown. These grew up at the Admiralty and War Office departments whose duty was the formulating of specifications. The word meant considerably more then than it does now. It meant, in fact, that the design calculations were carried out by the Service department concerned. Construction was, from beginning to end, inspected by Government officials.

Recalling "The Snag"

Soon after the war the basic airworthiness procedures were published in a volume known as H.P.806. The worked-out examples in H.P.806 referred to a particularly awkward aeroplane called the *Snag*. This book was the designer's guide to stress calculation. The basic volume, revised and enlarged, became famous as A.P.970, and was for a long time the bible of the designer of Service aircraft. By 1932, however, the differences between civil and military aircraft became recognised and a separate handbook for civil aircraft, known everywhere as A.P.1208, was produced.

In other words, during the war period the responsibility for the strength of aircraft lay with the Government. Soon after the war the responsibility was shared between the Air Ministry and the contractor.

The year 1923 saw the beginning of the "approved firm" system, by which certain firms were approved by the Air Ministry for conducting their own inspection of construction, under A.I.D. supervision. This form of approval has since spread to most of the industry and its associated firms. In 1928 another important step was taken, which shifted still more responsibility on to the shoulders of the constructors. It was in that year that the system of approved *designing* firms was introduced. The approved designing firm was considered able to make its own design investigations under the general supervision of the Airworthiness Department of the Air Ministry. In 1930 the approved designing firms were asked to guarantee the arithmetical accuracy of their calculations.

In the case of Service aircraft, the lecturer continued, there are no further important developments to record. In civil aircraft, however, the story continues, and a further stage in the emancipation of the designer can be deduced by comparing civil and military requirements. The first impression one formed, and quite an erroneous one, from such a comparison was that authority was more concerned for the safe carriage of bombs than for the safe transport of fare-paying passengers. A more correct deduction was that the civil designer was given a little more self-determination than the designer of Service aircraft.

The next important change arose from the findings of the Gorell Committee in 1934. That committee recommended that the control of airworthiness of civil aircraft should be handed over to an autonomous executive authority, to be composed of representatives of manufacturers, operators and underwriters. The Air Council accepted the recommendation in principle, but for the time being restricted the supervision of the authority (the Air Registration Board) to design and prototype inspection of aircraft up to 10,000 lb. gross weight and carrying fewer than eleven passengers. The Air Registration Board began work in April, 1937, was responsible for the inspection of "subsequent" aircraft and for the renewal of Certificates of Airworthiness, irrespective of size.

Dr. Roxbee Cox stated, with reference to the Gorell Committee's recommendation that the system of "approved" firms should be continued, with the A.R.B. as the approving authority, that the A.R.B. intends to extend this system and in the direction of placing as much responsibility for airworthiness as possible on the shoulders of the constructor.

By way of describing the working of the airworthiness system under the A.R.B., Dr. Roxbee Cox took the case of a company designing and constructing civil aircraft. Normally the firm would apply to the A.R.B. for approval of its design and inspection organisations. Officers of the A.R.B. would inspect the organisations and recommend to the Board that approval be granted, possibly suggesting certain amendments of the organisations first. The firm's design staff would be assumed competent to report the results of its design investigations. It would be expected to discuss with the Board its design assumptions and methods, but would not expect the Board to check its calculations. The Board would expect the firm to supply a "type record." This is a document which, by reference to drawings, calculations and tests, describes the design, indicates the reserve strengths of structural members, and gives such other information as is necessary to prove that the design meets requirements.

On the inspection side, approval would mean that the firm's organisation was considered competent to inspect construction under the general supervision of the Board's surveyors.

While proceeding with a particular design, the firm would be expected to discuss assumptions and methods with the Board's officers and to keep in touch with the Board during the progress of calculations and any tests which might be necessary. Construction would proceed under the supervision of the Board's surveyors.

In the past the official flight trials were generally done by R.A.F. personnel at Martlesham Heath. The A.R.B. does not, Dr. Roxbee Cox said, propose to establish a testing station for the present. Instead it was intended to compile a list of approved test pilots. From this list would be selected two pilots to conduct a particular set of C. of A. flight trials. The final recommendation to the Secretary of State for Air would be based on the results of three sets of flight trials: One by the applicant's pilot and one by each of the two pilots selected by the Board for the tests.

Dr. Roxbee Cox pointed out that the Board's pilots would be mainly concerned with the flying qualities. Performance tests, it was suggested, might be made by the applicant's pilot under the observation of the Board's officers. The drawing-up of the list of approved pilots was no easy matter, and the A.R.B. had asked for the assistance of the G.A.P.A.N. Mostly, experienced test pilots had their time fully occupied at present. Nevertheless, the Board hoped shortly to publish its list. He pointed out that the Board will lay down a schedule of tests which the pilots will be asked to make.

The take-off requirements would be checked by a camera method, and the necessary apparatus was now in an advanced stage of development. One great advantage of it was that it would be transportable, so that it could be taken to the contractor's aerodrome for the tests. He thought the transportability should particularly appeal to the smaller firms.

In conclusion Dr. Roxbee Cox asked those present to express their views on any particular aspect of the flight trials which they might consider important, and asked if they were satisfied with the present spinning tests, in which recovery must be made in two turns after spinning four turns. Did they think that spinning tests should be made at all on aeroplanes in the "normal" category ?

The Discussion

CAPT. F. DIGBY asked what the A.R.B. was doing about the question of ice formation in the carburetter. He thought it was time something was done.

MR. J. LANKESTER PARKER said he was very much the "new boy" [he has but recently joined the G.A.P.A.N.—ED.]. He thought a great deal of unnecessary work was being done on spinning and stalling, and asked what "stalling" meant. He had asked the question recently at a meeting at which the Air Ministry was represented, and everyone present had a different interpretation of the word. He thought the G.A.P.A.N. would be doing good work by helping the A.R.B. to lay down appropriate tests.

CAPT. H. S. BROAD thought they might substitute "fall" for "stall."

MR. R. A. C. BRIE pleaded guilty to having an anti-stall kink. He urged the A.R.B. to consider not only how many turns a machine should do in the spin and in the recovery, but also possible ways of avoiding the spin starting at all. He

thought a little sacrifice in performance would be well worth while in the interests of safety.

CAPT W. N. CUMMING disclaimed any particular qualifications to speak at that gathering, but thought the A.R.B. should not insist on obsolete safeguards, but should merely make quite certain that, in the course of its normal duties, the aeroplane should not be strained to a point which had not been foreseen in the calculations. He was sure the G.A.P.A.N. would do all it could to help the A.R.B.

MR. N. H. WOODHEAD asked for a definition of "airworthiness." He thought it possible that the pilot's conception might not be the same as that of the designer or constructor. He also pleaded for a simpler presentation of airworthiness mathematical problems in the technical Press. [When we get around to it, we will present Mr. Woodhead with a nice little book on Maths. without Tears.—ED.] He failed to understand why the Board's inspection was limited to machines of 10,000 lb. weight and ten passengers. With reference to "approved" firms he thought that if a firm was approved it should *be* approved and left to deal with its own inspection. [That is a point of view which *Flight* put forward more than once when the "approved" scheme first came into being.—ED.]

He would also like to know whether the Board intended to have on its panel test pilots only, or whether they would have airline pilots also. In his view that was rather essential. The test pilot was the best man for quantitative tests, but the best man for reporting on a new machine for its general qualities was the man who was going to use it. Without flying a machine for a considerable number of hours one could not judge its qualities. Fatigue might arise as a result of wrong placing of seats, or through a badly placed or dimensioned windscreen. He also queried why non-spinning aircraft should not be produced.

Medical Co-operation

WING COMMANDER P. C. LIVINGSTON said the problem of fatigue was an extremely important one. The Director of Medical Services was giving much of his attention to it. During this year and next there were going to be answers to a number of different aspects of this question. A close co-operation was developing between the flying branches and the medical branch of the service. This co-operation could not fail in the end to benefit both branches.

MR. L. A. WINGFIELD thought the A.R.B. might have some difficulty in drawing the dividing line between safety and performance when it came to details. He quoted as an instance the case of de-icing equipment. There was some question as to where the Board's province ended that that of the operating company began

MR. G. B MUSSON thought the A.R.B.'s function should be to encourage the development of aircraft, and to see that development was carried out along the right lines. He wished to know the Board's position on the matter of development of wireless equipment He thought the best way to get performance figures was from the constructor's test pilot. The ordinary pilot could not always get the best out of the machine in the way the firm's test pilot could. The Board's function should be that of an observer rather than that of a test pilot. Fatigue was not a question of the safety of the aircraft, but more attention should be paid to the comfort of crews. He had known of cases in which pieces of equipment, although excellent in themselves, were wrongly placed so that their use became difficult.

CAPT. R. C. PRESTON thought the work and position of the Ground Engineer had been inadequately recognised during the evening's debate. He related an experience he had last year on a flight to Edinburgh. It had caused him some trepidation, as it followed closely on the first renewal of his C. of A. by the A.R.B. instead of by the A.I.D. He asked for closer liaison between the technical staff and the working Ground Engineer.

In replying to the points raised in the discussion, Dr. Roxbee Cox said, to Capt. Digby, that the question of engine fading was one which was being closely examined by the Board. At present he could not say anything about possible preventive measures.

He agreed with Mr. Lankester Parker about stalling, but was less interested in the definition of the term than in the ability of an aircraft to fly dead slow without doing anything dangerous. Whatever tests the A.R.B. did would be directed towards ensuring that those unfortunate unsymmetrical occurrences did not happen.

To Mr. Brie's remarks about recovering from a spin, Dr. Roxbee Cox said the problem was one in which the designer and the scientist still had a lot to do. At the present state of knowledge it would be premature for the Board to lay down any hard and fast rules. Certain aeroplanes had been found difficult to get into a spin, and it would be a very good thing if they could be analysed so that one might know to what was due their reluctance. Mr. Brie had mentioned that the only sound basis for aviation was safety, and his own definition of airworthiness was "safety." He agreed with Capt. Cumming and others that it was up to all to collaborate with a view to making aeroplanes safe. Safety should be aimed at, even at the expense of performance and immediate profit. "If," Dr. Roxbee Cox said, "safety means carrying one less passenger, let us carry one less passenger."

In reply to Mr. Woodhead, Dr. Roxbee Cox said that he had recently had a talk with an eminent Dutch scientist who feared that accidents might have been caused in the past because certain warnings which he had expressed in too technical language had not been understood. He thought the reason for drawing the line at 10,000 lb. gross weight and ten passengers was that this quite arbitrary division was introduced because the Air Ministry felt that to pass all aircraft, irrespective of size, on to the A.R.B. would be rather a tall order. He thought there was a corresponding division in connection with ships, and that had probably been taken as a basis.

All Types Represented

As regards the pilots' panel, Dr. Roxbee Cox said the intention of the A.R.B. was that the list should include people with experience of large aircraft, small aircraft, airline work and private flying, so that when a particular type came up for tests the most appropriate pilots could be selected. He agreed that it was not possible fully to assess the qualities of an aeroplane unless a considerable amount of time was spent on it. As only a limited time was available for tests, these would be designed to show whether the aeroplane had any unfortunate vices, and to indicate whether there were any points which might be improved, having regard to the needs of the pilot.

He felt that when the Central Medical Board had completed their practical investigation into the causes of fatigue, it would prove a most valuable contribution to safety and might be used as a basis of airworthiness requirements designed to prevent the occurrence of fatigue.

To Mr. Musson, Dr. Roxbee Cox replied that he hoped the A.R.B. would be able in some measure to assist in seeing that development took place in the right direction, but its scope was somewhat limited.

Mr. Roxburgh, speaking "as a pilot who had never shone in any capacity," proposed a vote of thanks to Dr. Roxbee Cox. This was duly accorded.

WHY AND WHEREFORES OF PLASTICS

POSSIBILITIES of plastics for the fabrication of major aircraft components were mentioned by Mr. H. V. Potter, B.Sc., F.I.C., M.I.Chem.E., in the course of the second Keith Lecture, given at the Heriot-Watt College, Edinburgh, under the auspices of the Royal Scottish Society of Arts.

Mr. Potter (who is managing director of Bakelite, Ltd.) said that the question of size had hitherto been a drawback, but moulded laminated paper and wood had been produced up to 20ft. in length.

The lecturer dealt with the production and use of resinoid plastics. The first of these was the phenol-formaldehyde type, the constituents of which were obtained from coal and carbon monoxide and hydrogen. By mixing this resinoid with various fibrous fillers, moulding powders were produced from which mouldings could be made in a few seconds.

A disadvantage, commercially, of the phenol plastics was the fact that they could not be made in light colours. This need was met in 1920 with the development of amino-plastics, in which type the phenol was replaced with urea, obtained from carbon dioxide and ammonia. From both phenol and urea resinoids sheet materials could be produced, the former being of primary importance in the industrial sphere and the latter having a wide field of use for decorative work. The phenol sheet resinoid products were used in the manufacture of large gears, bearings and aeroplane instrument panels, and more than a million components for electrical insulation purposes in a single telephone exchange might owe their origin to this material.

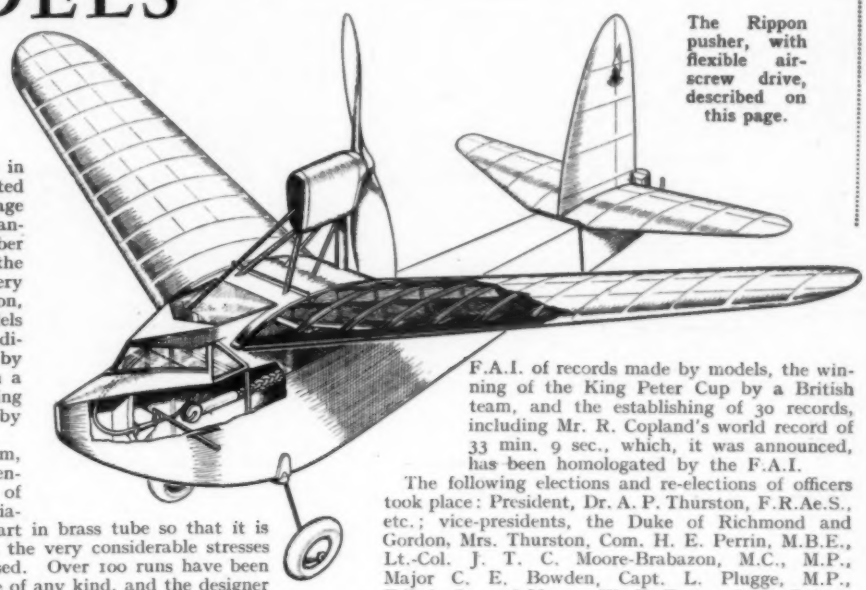
In yet another way the phenolic resinoids were assisting industry by facilitating the production of corrosion-resistant paints and varnishes. The resinoid was used here to replace or to supplement the natural resin base normally employed.

Mr. Potter next referred to the alkyd, vinyl and methyl acrylate resinoids. From the last-named type an organic glass was obtained which was light and non-brittle, and was being increasingly used for aircraft screens and windows.

MODELS

By

M. R. KNIGHT



The Rippon pusher, with flexible airscrew drive, described on this page.

Flexibility

THE type of pusher model in which the airscrew is mounted at the end of a short fuselage suffers from the great disadvantage that the length of rubber skein and, in consequence, the length of flight obtainable, is very restricted. Mr. C. A. Rippon, whose experience of pusher models is unrivalled, overcomes the handicap in his model "Cyrano" by placing the rubber skein within a full-length fuselage, and contriving that it shall turn the airscrew by means of a flexible drive.

This simple piece of mechanism, the outcome of lengthy experimentation, consists of a portion of spiral spring wire of small diameter, enclosed for the most part in brass tube so that it is prevented from knotting under the very considerable stresses set up when the motor is released. Over 100 runs have been made without mechanical failure of any kind, and the designer now considers it sufficiently developed to be used in the near future in a twin-motored flying boat, for which purpose it should be particularly useful.

The 1½oz. rubber motor consists of 10 yards of ¼in. flat strip made up into 12 strands. The end of the front supporting hook is held in a tinplate frame, and is filed to fit into one end of the spiral drive, which consists of 22 s.w.g. wire wound on a mandrel of the same material, which is held in the chuck of an ordinary hand drill. The hand drill is rotated, and the spiral guided along the mandrel wire with the thumb and forefinger of the left hand, which must be protected with a piece of leather if severe burns are to be avoided! The drive, after leaving the support, passes through a curved length of brass tube concealed in the nose of the fuselage, emerging from a soldering-sleeve as a plain wire. It passes through another sleeve, and enters the dummy engine-cowling as a spiral drive within another brass tube. The final length of spiral is plugged with 22 s.w.g. wire, and sweated hard, becoming the airscrew-shaft. Friction has been reduced to a very small amount. The airscrew is 10in. in diameter, and about 14in. in pitch.

While the rubber skein is being wound, which is done from the rear, the drive is held by a brake, visible on the port side of the fuselage.

"Cyrano," though not without aerodynamic interest, is purely experimental—hence, presumably, the generous dihedral. The wings are backswept, 20 deg. on the leading edge, and 15 deg. on the trailing edge, the chord tapering from 7 in. to 5in. The tip-to-tip span is 38in., and the wing area approximately 230 sq. in. The fuselage is 31½in. long, 6in. deep in the region of the wing, and 3¼in. deep to the rear of the airscrew.

A tailplane of lifting section is employed, the span being 8in., and the chord tapering from 5½in. to 3in. It is interesting to learn that a rolling tendency experienced when the tailplane was in line with the thrust-line completely disappeared when it was lowered to its present position. There is now no appreciable alteration in trim when the power ceases.

The all-up weight is 11oz. Flights of 45 sec. have repeatedly been obtained, which figure should be materially improved upon in a second edition.

S.M.A.E. Expansion

THAT model aviation in Great Britain is on the up-grade was made abundantly clear at the annual general meeting of the Society of Model Aeronautical Engineers, recently held at the Royal Aeronautical Society, Albemarle Street. Three years ago, when the S.M.A.E. was reconstituted, there were 12 affiliated clubs; now there are 92, representing a membership of 2,553. No fewer than 147 petrol models have been registered. This expansion has led to the adoption of a scheme under which the country will be divided into areas, largely self-governing, and whose delegates will form the S.M.A.E. council. It has also involved the hon. secretary in the receiving and answering of over 2,000 letters during the year!

Outstanding events of the year were the recognition by the F.A.I. of records made by models, the winning of the King Peter Cup by a British team, and the establishing of 30 records, including Mr. R. Copland's world record of 33 min. 9 sec., which, it was announced, has been homologated by the F.A.I.

The following elections and re-elections of officers took place: President, Dr. A. P. Thurston, F.R.Ae.S., etc.; vice-presidents, the Duke of Richmond and Gordon, Mrs. Thurston, Com. H. E. Perrin, M.B.E., Lt.-Col. J. T. C. Moore-Brabazon, M.C., M.P., Major C. E. Bowden, Capt. L. Plugge, M.P., F.R.Ae.S., and Messrs. W. E. Evans, C. R. Fairey, M.B.E., F.R.Ae.S., A. F. Houlberg, A.M.I.Ae.E., B. K. Johnson, D.I.C., F.R.M.S., Percival Marshall, C.I.M.E., J. Laurence Pritchard, and G. Geoffrey Smith, M.B.E.; chairman, A. F. Houlberg; vice-chairman, L. J. Hawkins; hon. secretary, E. F. H. Cosh (who was also elected a Fellow in recognition of his services); hon. treasurer, L. J. Hawkins; competition secretary, J. C. Smith; Press secretary, H. York; technical secretary, Flt.-Lt. R. N. Bullock.

Models on Show

CONSIDERABLE diversity marked the model aircraft display at the Schoolboys' Exhibition, recently held at the Horticultural Hall, London. S.M.A.E. exhibits included Mr. Copland's world record holder; an exceptionally fine example of monocoque construction in the form of a glider by Mr. Pope; a twin-ruddered pusher biplane, with tail carried on two booms, by Mr. L. Mann; a shoulder-wing monocoque "Wakefield" model with three-bladed airscrew by Mr. H. W. Beckett; a pusher seaplane by Mr. R. T. Parham; the Crow biplane described in *Flight* of December 8 last; a well-cowled petrol-engined high-wing cabin model by Mr. E. Keil; and the present writer's successful composite model—13in. mid-wing carried on a 26in. low-wing—with single-bladed airscrew. On another stand was a magnificent flying scale-model of the Miles Master trainer.

Scale and Semi-scale

THE scarcity of flying scale-models, doubtless due to the scarcity of prototypes which lend themselves to the incorporation of sufficient stability to fly without a pilot, and to the meagre performance as compared with free-lance types, is regrettable, for a really good model of this class, such as the Heston Phoenix, Fokker *Faucheur*, Miles Master, and Airspeed Envoy produced by Mr. H. J. Towner, of Eastbourne, is a fascinating thing.

One notes with interest that a flying scale contest, for which a *Flight* Trophy will be awarded, is again included in the programme of the annual gala of the Northern Heights Model Flying Club, the seventh of which meetings takes place at Fairey's Great West Aerodrome on June 18. The "semi-scale" type—free-lance designs approximating in appearance to full-scale—is again to be encouraged by the award of the handsome Coronation Cup. Design and workmanship will score as well as the average duration of three rise-off-ground flights.

Full details may be obtained by sending 2d. in stamps to Mr. C. A. Rippon, 58, Hampden Way, London, N.14.

* * *

A return flight to Paris, presented by Imperial Airways, is one of the 50-odd prizes for this year's Skybird League Rally. There is also a prize for entrants from the R.A.F. Details from the Secretary, The Skybird League, 3, Aldermanbury, London, E.C.2. Skybird models are 1/72nd-scale non-flying models.

IMPERIAL DEFENCE: A Short Sunderland (four Bristol Pegasus XXII) refuelling at Keamari, near Karachi, on its way out to Singapore. This photograph, like certain of those used in connection with our Empire Air Forces Number last week, is published through the courtesy of *Shell Aviation News*.

THE INDUSTRY

New Trade Developmen's : Engine Manufacturers' Progress : Improved Retractable Tail Wheel : Degreasing by Water : Patents : New Companies

A.G.S. Parts

A LONDON firm that is holding increasingly large stocks of A.G.S. parts, Mosers, Ltd., of Borough High Street, London, S.E.1 (and at 112-114, Old Hall Street, Liverpool), is now issuing a monthly stock-list of such parts. The first list—which, incidentally, is a model of clean, clear printing—covers some ninety items in many hundred sizes.

Mass-producing Balloons

A NEW fabric, lighter and with better gas-holding properties than any previously used is, it is claimed, being used at the new Dunlop balloon factory in Manchester in the mass-production of barrage balloons.

The factory is laid out like a laboratory, with light-coloured walls, polished surfaces and conditioned air; the result is that grit, which is fatal to balloon fabric, is obviated.

About Conveyors

THE many applications of a well-designed works conveyor track are described and illustrated in great detail in a finely produced 276-page art-paper catalogue published by G. W. King, Ltd., Hertford Works, Hitchin, Herts. It deals with their overhead mono-rail conveyors, overhead twin-rail conveyors, floor and special conveyors, trucks, and storage, stacking and special equipment. One of the illustrations shows a mono-rail conveyor in use in an airscrew factory.

New Sub-Contractors in Country

FOR some time past the Lea-Francis Motor Car Co. have been doing sub-contracting machining work and producing small jigs, tools and fixtures at their premises in Much Park Street, Coventry. Within the last few weeks this work has been augmented by the opening of a small, fully approved department for aircraft sheet-metal work.

Two other Coventry car firms besides Lea-Francis, namely, Riley and Singer, are now very busy on important aircraft sub-contract work.

Self-winding Winches

OPERATING, roughly speaking, on the well-known roller-blind principle, a series of self-winding electric cable reels has been developed by Power House Components, Ltd., Albion Chambers, King Street, Nottingham.

Wayne reels, as they are known, are made in a great variety of sizes, ranging from small types for ordinary lighting flex, to reels to handle heavy multi-cored flexible cable. They should have particular application for portable floodlight work. It is stated that they are supplied to the Air Ministry, Admiralty, and War Office.

All types are described in a loose-leaf catalogue recently issued by the makers.

Busy by the Riverside

A SECOND large order from a West of England aircraft manufacturer has been received by Watermota Marine Engines, Ltd., of Hampton Wick, Middlesex, who recently announced that they were accepting sub-contract work and were installing additional plant to cope with it.

Storage-bin Price Reduction

IN these days of ascending costs of raw material it is refreshing to hear of a reduction in price for a sheet-steel product. The "Progresso" steel storage bins, for which Brown Brothers, Ltd., Great Eastern Street, London, E.C.2, are distributors, will enjoy a reduction of approximately 5 per cent. as from January 21.

"Progresso" bins are a series of standardised 3ft. units which can be built into almost any shape.

Napier Chairman on "Ballons d'Essai"

A SPEECH that was refreshingly different from the ordinary run of company-meeting oratory was made at the Napier general meeting by the chairman, Sir Harold Snagge, K.B.E. In its course he said "If we are not so liquid, to use the dreadful jargon of finance. . . ." His actual avoidance of the "dreadful jargon" was exemplary.

As an engineering business Napiers had been established 130 years, but this was the twenty-fifth meeting as a public company, and the "jubilee report" of the directors was signalised by the omission, for the first time for some years past, "of that enervating paragraph regarding the non-payment of a dividend on the 8 per cent. non-cumulative preference shares."

Two outstanding features were a trading profit of £103,006—an increase of £45,000 over the figure for 1937, and a net profit of £60,395, as compared with £33,983 a year ago, after increasing depreciation from £31,064 to £38,445, and writing-off a sum of £10,000 from manufacturing rights.

Sir Harold went on to say:—

"The business consists, as you know, of the manufacture of engines for aeroplanes, engines for speed-boats, and engines for other naval and marine purposes. The 'Power-Napier' engines, thanks largely to the genius of Mr. Hubert Scott-Paine, the incomparable designer and pioneer of the modern speed-boat in this country, have been giving a good account of themselves. . . .

"Of aero engines it is more difficult to speak because of certain 'inhibitions' properly imposed upon us where development work is concerned. We have it on the express authority of Imperial Airways that the four Rapier engines in the *Mercury*, the upper component of the Mayo Composite aircraft, proved their worth, their capacity, and their reliability up to the hilt in Transatlantic flights last autumn, and in the recent non-stop record flight to the Cape which followed them, while our Dagger engines, now in service, are reported to be giving every satisfaction to the squadrons in which they are employed.

"But Rapiers and Daggers and Power-Napiers do not tell the whole story of our activities. We have, I am glad to say, now reached the stage of production of standard types on a limited scale, and our factory is fully engaged on work of this description; but the design and development of a new engine, in advance, we believe, of anything now in the air, is our main preoccupation at the present time, and we are doing all in our power to ensure its emergence at an early date.

"As I have already said, I am debarred from giving you any sort of specific information, though I have lately seen in the columns of the popular Press repeated and circumstantial references—unofficial but intriguing—to forthcoming adventures of a sensational nature in which, according to these reports, this company is to play a prominent part in the provision of the power unit.

"Well, well—the *ballon d'essai* is the most venerable of all flying machines, and people are not to be blamed for being inquisitive as to the extent of the fire that causes so much smoke. I should like to be able to satisfy the natural curiosity of some of my correspondents if I could, but the time is not yet.

"Nevertheless, this firm, with its many and great traditions, is determined to take its place once again as the supplier of the finest aero engine in the world, a position it held unchallenged in the days of the Lion, and all our energies and the exceptional skill of our technical staff, headed by Major Halford, our chief designer, are being devoted to this end. You do not need to be reminded that difficulties, delays, and disappointments lie in the daily path of this business of aero engine building, but, as Cardinal Newman once wrote in another connection, 'Ten thousand difficulties do not make one doubt,' and we here have no doubt of the issue."

The chairman concluded by welcoming Mr. C. W. Reeve to the Board as chief executive director, and by thanking "all our men, from the heads to the last-joined apprentice."

Tucking-in the Tail Wheel

SIMPLICITY is the outstanding feature of the new Dowty retractable tail wheel shown in the accompanying photographs. The jack which effects retraction and extension of the unit also operates a locking plunger to hold the wheel in the extended position.

The plunger, situated at the upper end of the unit, is attached to a sleeve sliding on the outside of the main shock-absorber member. The lower end of the sleeve is provided with a cross pin engaging with curved slots in brackets rigidly attached to the cross-shaft on which the tail wheel rotates. These slots are so shaped that the first part of the movement of the operating jack withdraws the locking plunger from its socket on the aircraft structure, but without imparting any retracting movement to the unit.

After the plunger has been completely withdrawn, the pin can travel round in an arc and a movement is produced about the pivot, causing the shock-absorber to swing into a horizontal position.

In the reverse operation the first part of the piston rod travel swings the tail wheel into the landing position. Then a vertical extension of the slots allows the jack to travel still farther and so force the locking plunger home. Locking, it is stated, is absolutely positive.

The shock-absorber, which may be of either the spring or oleo-pneumatic type, is equipped with a self-centering device to ensure satisfactory retraction within the space provided in the fuselage.

Aircraft Components, Ltd., of Cheltenham, are the manufacturers.

Airspeed's "Annual"

NEARLY 500 members of the Airspeed organisation attended the fourth annual dinner of the company's Sports and Social Club at the Savoy Café, Southsea, on February 17. The board and management of Airspeed, Ltd., were fully represented.

The toast of "The Firm" was proposed by Mr. Jack Fallan. In doing so he traced the history of Airspeed, Ltd., from the time when it produced its first glider [an Airspeed Tern sailplane, incidentally, is still—or was until recently—flying at Dunstable] to the production of Oxfords in large numbers. He stressed the strong team spirit which prevailed among the employees, and also the co-operation which existed between the directors and the staff. He also expressed regret that the aeroplane was being turned from its true purpose as a means of bringing men and nations closer together.

Mr. G. Wigham-Richardson, chairman of the company, in replying to Mr. Fallan's toast, was more optimistic. He considered that the possibility of war was not so great as some thought. He reiterated his remarks made at the previous dinner, when he had explained that the board intended not only to build aeroplanes but to establish an industry which should give continuous employment to the largest number of men possible.

Finally, he announced that the directors had decided to provide a new canteen for the men. (Cheers!)

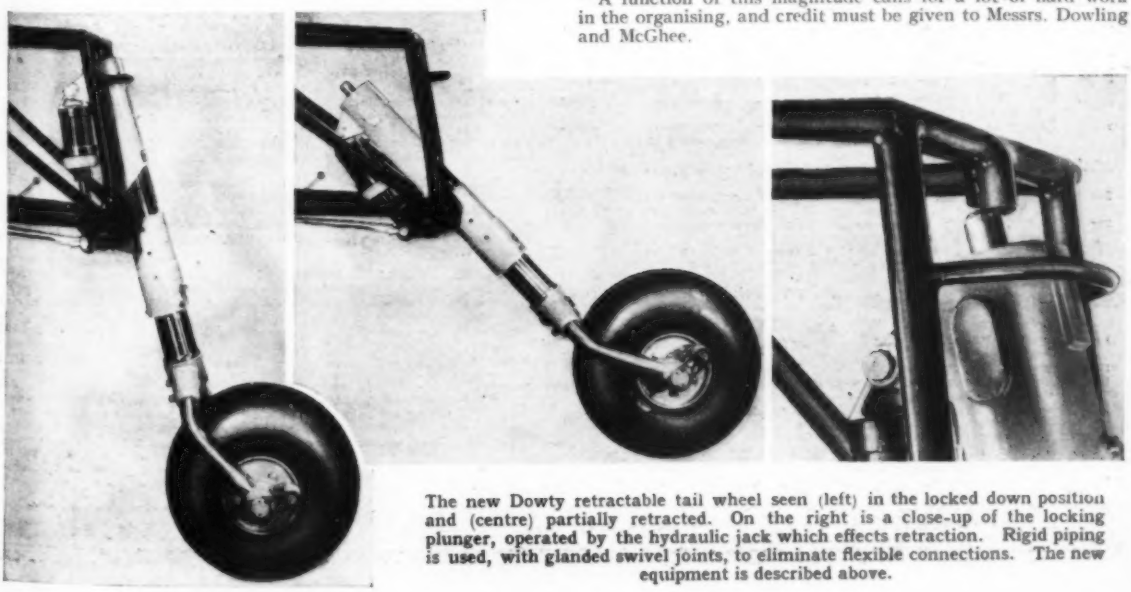
Mr. A. Townsley, general manager, next proposed the toast of the Air Ministry. He said that Airspeed, Ltd., had been twice asked to speed up their schedule of production, and their efficiency in doing so had drawn the statement from Sir Kingsley Wood that the company had never let the Air Ministry down.

In replying to this toast, Mr. A. E. Hayward, B.Sc., of the Air Ministry, paid a tribute to the good work of Mr. Hessell Tiltman and complimented the company and its employees on their unfailing efforts rendered directly and indirectly to the Ministry. The company was the youngest firm to have their products built by outside contractors.

Speechmaking was brought to an end by the reply of Mr. H. Povey, chief inspector of De Havillands, on behalf of the guests, to the toast proposed by Mr. E. C. Green, chief inspector of Airspeed, Ltd.

Among the guests present were Mr. H. Windsor and Flt. Lt. Dennehy—both of the Air Ministry—Mr. A. H. Tiltman, B.Sc., F.R.Ae.S., Mr. Payne, of the Contracts Branch of the Air Ministry, Mr. J. Liddell and Mr. Salter Booth.

A function of this magnitude calls for a lot of hard work in the organising, and credit must be given to Messrs. Dowling and McGhee.



The new Dowty retractable tail wheel seen (left) in the locked down position and (centre) partially retracted. On the right is a close-up of the locking plunger, operated by the hydraulic jack which effects retraction. Rigid piping is used, with glanded swivel joints, to eliminate flexible connections. The new equipment is described above.

THE INDUSTRY (CONTINUED)

New Companies in 1938

ACCORDING to statistics compiled by Jordan and Sons, the company registration agents, 81 new companies concerned with aviation were registered during 1938; only one of these was a public company. The total capital involved was £736,299.

Among the biggest capital figures recorded was the £100,000 of Simmonds Aerocessories (Western), Ltd., and the £125,000 of Crouch-Bolas (Aircraft Appliances), Ltd.

A Water Degreasing Process

REFERENCE to the sale by Brown Brothers, Ltd., of a degreasing preparation known as Gunk was made recently in these pages. The material is distributed in this country by Charles Mack and Co., 84-85, Trevelyan Buildings, Corporation Street, Manchester, 4.

Some further tests have been carried out which indicate that Gunk has, in fact, some very valuable properties. It is a dark, heavy liquid with a strong "disinfectant" smell, but it will not damage fabric, paint, leather or wood; it is non-injurious to the hands and there are no toxic fumes.

Its action is to saponify mineral oils so that a water-soluble emulsion is formed. Animal oils and fats can also be treated, but it does not react with vegetable oils.

Since it is harmless to fabrics and paint, surfaces which have been covered by oil spray can—if lightly smeared or sprayed with Gunk—be washed down with water and, without rubbing, all oil is removed. Thus it has obvious possibilities for cleaning wings and fuselage and other parts liable to be spattered by oil spray.

Fabrics, such as cleaning cloths, overalls, etc., no matter how loaded with oil, if dipped bodily into the preparation can be rinsed out in cold water, after the surplus Gunk has been wrung out back into the container, and emerge quite as clean as if they had been boiled in soap suds, and suffer neither shrinkage nor weakening.

Apart from mechanical parts, which may be either sprayed, brushed or dipped, before water washing, Gunk will enable oil to be hosed with cold water from concrete floors and even long-standing oil stains in concrete or wooden floors can be eliminated by two or three applications.

Gunk will emulsify three or four times its own bulk of mineral oil, so that it is quite economical to use. Many applications, apart from the foregoing, have been tested independently of its sponsors, and it may be stated that oil can be removed completely from any material or mechanism that can be safely given the final wash with cold water.

"Welflex" Pistons

EXHIBITED at the Birmingham section of the British Industries Fair, and commented upon in these pages last week, the "Welflex" products of Wellworthy, Ltd., are pistons, and not piston rings.

Fastening the 95's Cowlings

THE name of Thos. P. Headland, Ltd., of 164-168, Westminster Bridge Road, London, S.E.1, should be added to the recently published list of suppliers of equipment for the D.H. 95; their "DZUS" self-locking fasteners are used on the cowlings and elsewhere.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

(Published January 20, 1939)

14514. CRANE, C. J., and NESBITT, F. G.: Indicating instruments, more especially for aircraft (497,930).
17744. BENDIX AVIATION CORPORATION: Instruments for determining atmospheric conditions (497,754).
17866. MARCONI'S WIRELESS TELEGRAPH CO., LTD., and WALKER, L. E. Q.: Radio direction-finding receivers (497,761).
18021. SWINGLE, E. L.: Flying machines (498,010).
17902. JONES, T. B.: Aerial forts (497,938).
18199. ASKANIA-WERKE AKT.-GES. VORM. CENTRALWERKSTATT DESSAU & C. BAMBERG-FRIEDENAU, and BACH, G.: Control mechanism incorporating a stabilising device (497,947).
18232. SOC. CIVILE D'ETUDES DE CONSTRUCTIONS AERONAUTIQUES E.C.A.: Gyroscopes (497,953).
18426. HANDLEY PAGE, LTD., and LACHMAN, G. V.: Aircraft (497,969).
5352. FREYN, H.: Plotting instrument and scales for use in navigation (497,897).
6124. WALLER, G.: Controlling flying boats during take-off, flight, and alighting (497,780).

(Published February 2, 1939.)

19113. STANDARD TELEPHONES AND CABLES, LTD., and WAGSTAFFE, C.F. A.: Wireless direction-finding systems (498,417).
21691. ROE & CO., LTD., A.V., and TAYLOR, R. F.: Methods of attaching sheet metal or other parts to structural members (497,058).
21867. METCALFE, L.: Airscrew spinners and latching devices therefor (498,157).
23126. HEINKEL, E.: Adjustable seat with movable back for aeroplanes (498,164).
23441. RENAULT, L.: Aircraft fuselage and like metallic constructions (498,063).
24217. SHORT BROS. (ROCHESTER & BEDFORD), LTD., and PARKS, A. G.: Heating systems for aircraft (498,069).
27241. FAIREY AVIATION CO., LTD., BOLTON, F., and HETHERINGTON, J.: Slings and like releasable devices for carrying torpedoes, bombs and the like on aircraft (498,194).
27559. SHORT BROS. (ROCHESTER & BEDFORD), LTD., HART, S. G., and WILKINSON, B.: Cabin windows for aircraft (498,077).
27965. ROCHE, C. P. V.: Apparatus permitting of ascertaining data relative to the probable location of aircraft in flight over known routes (498,198).
28867. BERRY, R. J. (Lorenz Akt.-Ges., C.): Wireless short-wave directional systems (498,344).
1767. SAULNIER, R.: Tail skids or tail wheels for aircraft (498,361).
2153. FOCKE, H.: Rotors for rotating-wing aircraft (498,363).
3939. CAPRONI, G.: Aerial barrage (498,114).
5117. WEST INSTRUMENT CO., INC.: Electric signalling systems for navigational purposes (498,279).

(Published February 9, 1939.)

13124. SPERRY GYROSCOPE CO., LTD., HARDING, W. G., and NISBET, R. H.: Electrical transmission systems (498,738).
15977. MOTLEY, L.: Bombs and projectiles for use in aerial warfare (498,595).
16058. VICKERS-ARMSTRONGS, LTD., and WATSON, J. P.: Apparatus for use in fire control of anti-aircraft guns (498,744).
16059. VICKERS-ARMSTRONGS, LTD., and WATSON, J. P.: Apparatus for use in fire control of anti-aircraft guns (498,745).
16305. JABLONSKY, B.: Wooden airscrews (498,674).
18769. TAMPIER, R.: Device for controlling carburetters of internal-combustion engines in aircraft (498,675).
19427. SPERRY GYROSCOPE CO., LTD., and CLOUSTON, C. E.: Means for conveying electric current to cylindrical conductors (498,681).
19784. SPERRY GYROSCOPE CO., INC.: Method of and apparatus for determining the unbalance of rotors and enabling them to be correctly balanced (498,899).
27369. COWTY, G. H.: Aircraft undercarriages and wheel brakes (498,540).
32725. LORENZ AKT.-GES., C.: High-frequency signalling systems (498,627).
35482. UNITED AIRCRAFT CORPORATION: Density-responsive device (498,555).

(Published February 16, 1939.)

21116. VEREINIGTE DEUTSCHE METALLWERKE AKT.-GES.: Gear for varying the pitch of the blades of variable-pitch screws (499,223).
27705. LORENZ AKT.-GES., C.: Apparatus for instructing aircraft pilots in instrument flying methods (498,940).
3395. JUNKERS FLUGZEUG-UND-MOTORENWERKE AKT.-GES.: Wings, control surfaces, rudders and the like of aircraft (499,068).
3425. DORNIER-WERKE GES., and DORNIER, C.: Flying-boats (499,069).
4073. FOCKE, H.: Control of helicopter or rotating-wing aircraft (499,073).
6882. KRONPRINZ AKT.-GES. FUR METALLINDUSTRIE, and LUDWIG, W.: Brake devices, more especially for the wheels of aircraft (499,160).
10548. LAURET, M. A.: Carburetter for aviation engines (498,974).
11220. LORENZ AKT.-GES., C.: Antenna structures, particularly for radio direction-finding systems (498,985).
12577. JUNKERS FLUGZEUG-UND-MOTORENWERKE AKT.-GES.: Means for checking the dimensions of structural parts such as castings, forgings, and stampings (499,089).
17555. TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE: Radio direction-finders (498,995).
18750. ARMSTRONG SIDDELEY MOTORS, LTD., FELL, L. F. R., and LLOYD, J.: Arrangements for aircraft engines and propellers (499,004).
19020. DAIMLER-BENZ AKT.-GES.: Diesel engines provided with pre-combustion chambers (499,283).

NEW COMPANIES

HENDERSON SAFETY TANK CO., LTD.—Private company, registered February 2. Capital, £27,000 in 22,000 redeemable 6 per cent. cumulative preference shares of £1 and 40,000 ordinary shares of 2s. 6d. each. Objects: To acquire from A. J. Henderson, A. J. B. Coates and C. A. Forecast the benefit of certain existing inventions relating to improvements in tanks and the like for carrying inflammable spirit on aircraft, ships, vehicles or the like; and to carry on the business of manufacturers of and dealers in petrol and other tanks, etc. The permanent directors are: Arthur J. B. Coates, Cecil A. Forecast, and Arthur J. Henderson. Registered office: 11, Waterloo Place, Pall Mall, London, S.W.1.

AUTOGIRO FLYING CLUB, LTD.—Private company, registered February 1. Capital, £1,000 in 1,000 shares of £1 each. Objects: To establish an aeroplane or flying club and to afford its members facilities for flying and tuition in flying the gyroplanes constructed under the Cierva Autogiro Company, Ltd. patents. The first directors are not named. Solicitors: Harrington Noble & Co., 376, Strand, London, W.C.2.

CLARKE AIRCRAFT PRODUCTS, LTD.—Private company, registered February 8. Capital, £20,000 in 20,000 shares of £1 each. Objects: To carry on the business of manufacturers of aircraft and aero engines and components and accessories relating thereto; manufacturers of wireless and television products, etc. The directors are: John W. Danielsen (director of Deritend Stamping Co., Ltd.); Henry B. Clarke (director of H. B. Clarke Engineering Co., Ltd.); and Peter J. Danielsen, 47, Wellington Road, Edgbaston (director of H. B. Clarke Engineering Co., Ltd.). Registered office: Carlton House, Regent Street, S.W.1.

SOUTH EASTERN AIRLINES, LTD., was registered as a private company on February 2, with a nominal capital of £1,000 in £1 shares. Objects: To carry on business as proprietors and manufacturers of and dealers in aircraft, proprietors of aerodromes, hangars landing places and stations; and carriers of passengers and goods; to establish, maintain and work lines of aerial conveyances, etc. The first directors are not named. Solicitors: Hemming & Barr, 1, Mitre Court Buildings, Temple, London, E.C.4.

ROWLAND WELLER (AIRWORK), LTD.—Private company, registered January 30. Capital, £1,000 in 1,000 shares of £1 each. Objects: To carry on business as aeronautical experts and consultants, manufacturers of and dealers in aeroplanes, parachutes, gliders, etc. The directors are: Rowland Weller (director of Rowland Weller (Coal) Limited), and Mrs. Lucy E. Weller. Registered office: Glebelands, The Tilt, Cobham, Surrey.